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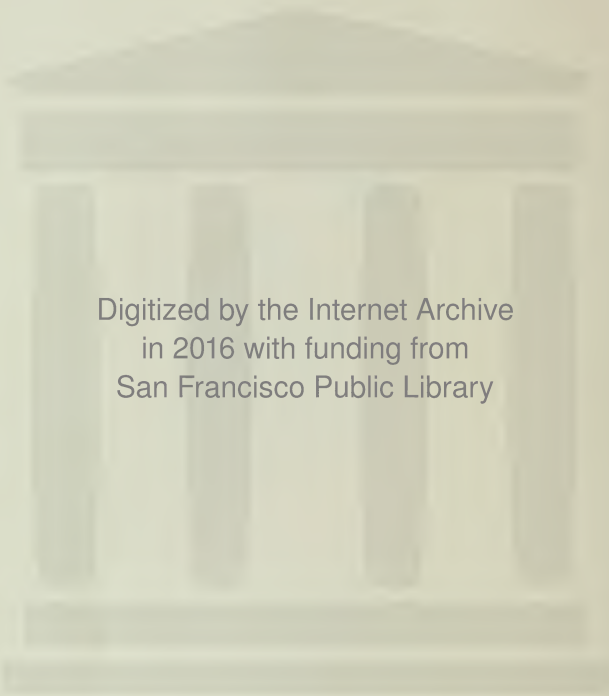


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DRAFT

**ENVIRONMENTAL
IMPACT
REPORT on
PROPOSED
Toll & Fare
Increases**

JUNE 7, 1977



GOLDEN GATE BRIDGE, HIGHWAY AND TRANSPORTATION DISTRICT

NOTICE OF
AVAILABILITY OF DRAFT ENVIRONMENTAL IMPACT REPORT
ON PROPOSED INCREASE IN GOLDEN GATE BRIDGE TOLLS
AND TRANSIT FARES

The Golden Gate Bridge, Highway and Transportation District hereby gives notice that it has prepared a draft Environmental Impact Report on proposed increases in automobile tolls and fares for transit buses and ferries operated by the District.

Copies of the Draft Environmental Impact Report, at a cost of \$7.50, may be obtained by writing to or obtaining in person from:

District Secretary
Golden Gate Bridge, Highway and Transportation District
District Administration Building, Toll Plaza
P. O. Box 9000, Presidio Station
San Francisco, California 94129

Copies of the Draft Environmental Impact Report have also been sent to public library systems in Marin, Sonoma, Napa, Mendocino, Del Norte Counties, and the City and County of San Francisco.

The District solicits comments on the draft Environmental Impact Report. Comments may be submitted to the District at the following address:

Golden Gate Bridge, Highway and Transportation District
Office of Planning and Research
1011 Anderson Drive
San Rafael, California
Attention: Peter Dyson

A Public Hearing on the Draft Environmental Impact Report will be held Tuesday, July 19, 1977, at 7:30 p.m., in the Board Room, District Administration Building, Toll Plaza, San Francisco. A subsequent hearing on policy of proposed toll and fares increases will be held at a date and place to be announced.

Comments must be submitted prior to August 2, 1977.

Dated: June 17, 1977.

Carney J. Campion, Secretary



GOLDEN GATE BRIDGE, HIGHWAY AND TRANSPORTATION DISTRICT

June 7, 1977

DRAFT ENVIRONMENTAL IMPACT REPORT

ON

PROPOSED TOLL AND FARE INCREASES

PREFACE

The Golden Gate Bridge, Highway and Transportation District is a special district which provides public transit service within Marin and Sonoma Counties and between San Francisco, Marin and Sonoma Counties. The District also operates and maintains the Golden Gate Bridge. It provides these public services under authority of California state law.

The District's funding is provided from the collection of fares or tolls from persons using the transit system or the bridge and, to the extent possible, from operating and capital subsidies made available through Federal, State of California and local governments. The District does not have property, sales or other taxing authority.

Current review of the District's financial condition reveals that although needs and demands upon the District continue to grow the current level of operations cannot be maintained during the year 1978 without increased funding. Therefore, if the District is to continue meeting the needs of the corridor, it is unavoidable that actions be taken to increase revenues through fare or toll increases.

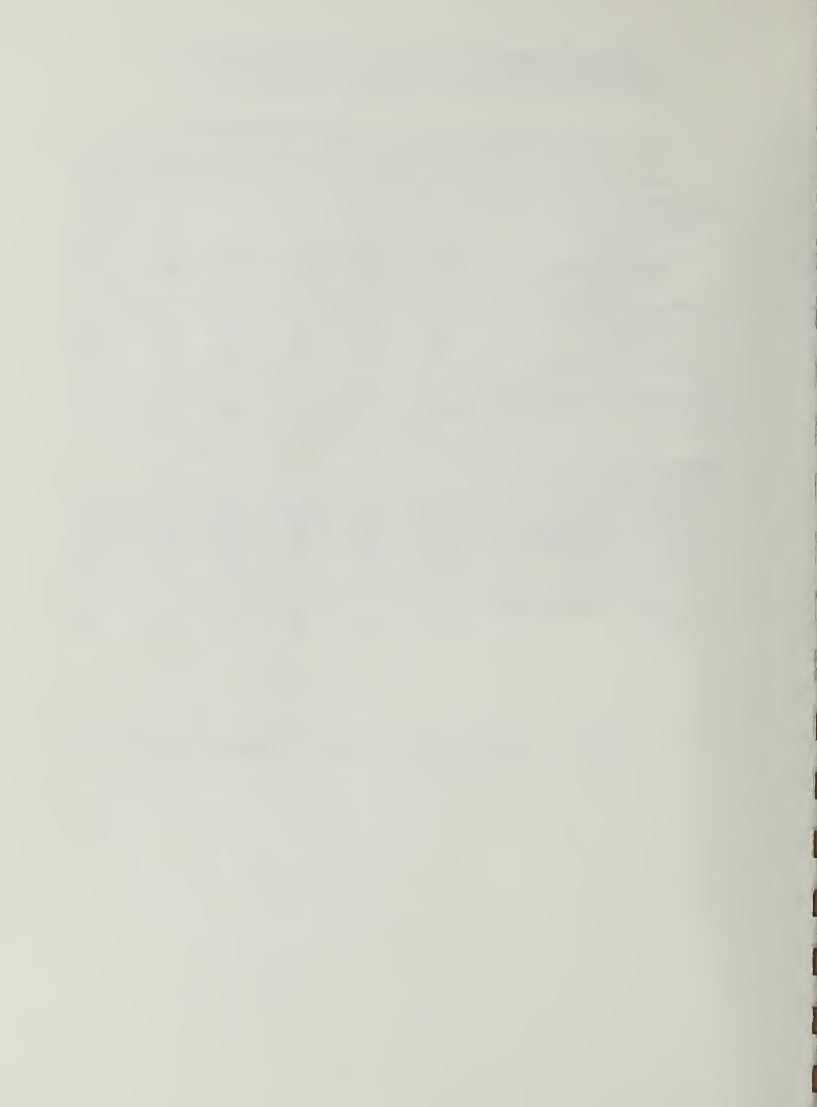
The Board of Directors of the Golden Gate Bridge, Highway and Transportation District has initiated a public process to consider a range of possible actions and has authorized environmental impact studies, documented in this report, as a part of that process.

To aid the reader in reviewing this document, the next page contains a summary highlighting differences of the alternative fare and toll proposals studied.

PRINCIPAL FEATURES OF THE SIX ALTERNATIVE PROPOSALS
(For full details of the Alternatives, see Section 2.4)

	ALTERNATIVE NUMBER					
	1	2	3	4	5	6
<u>AUTO TOLL</u>						
Commute Period						
1 occupant	\$1.00	\$1.00	\$1.00	\$1.00	\$1.50	\$2.00
2 occupants	1.00	1.00	1.00	1.00	0.75	1.00
3 or more occupants	FREE	FREE	FREE	FREE	FREE	FREE
All Other Times						
1 occupant	1.00	1.00	1.00	1.00	1.50	1.00
2 occupants	1.00	1.00	1.00	1.00	0.75	1.00
3 or more occupants	1.00	1.00	1.00	1.00	0.75	1.00
Discount on Convenience Books	20%	0	0	10%	0	0
<u>TRANSIT FARES</u>						
San Francisco to						
Southern Marin	1.00	1.00	1.00	1.00	1.00	1.00
Central Marin	1.25	1.25	1.25	1.25	1.25	1.25
Western/Northern Marin	1.50	1.50	1.50	1.50	1.50	1.50
Southern Sonoma	2.00	2.00	1.75	2.00	2.00	2.00
Central Sonoma	2.25	2.25	2.00	2.25	2.25	2.25
Discount on Convenience Books	20%	20%	10%	10%	20%	20%

NOTE: No change to tolls for vehicles other than automobiles.



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1.0 SUMMARY

The Golden Gate Bridge, Highway and Transportation District proposes to increase tolls for private automobiles crossing the Golden Gate Bridge and increase fares for intercounty trips on the District's bus and ferry transit services. The objective of the proposed increases is to generate additional revenues of approximately \$4 to \$6 million per year to provide for repair of the Bridge and permit continued operation of the transit services. The only alternative to the increased revenues is a substantial reduction in transit services, beginning during FY 1977/78. Six alternative combinations of toll increase and fare increase are being considered.

The components of the toll and fare increase and the distinctions between the six Alternative Proposals are complex. They are described in detail in Chapter 2. Prime focus in the analysis is given to Alternatives 1 and 2. Alternative 1 involves an increase in tolls for private automobiles from \$.75 to \$1.00 and increases for intercounty transit fares varying from \$.25 up to \$.75 for the longest journeys. Convenience books of 20 tickets would be sold at 20% discount and would be available for payment of either tolls or fares. The revised scale of transit fares would include an additional fare in northern Marin County and certain other zone boundary charges. Alternative 2 is identical to Alternative 1, except that the discount would not apply to tolls. Alternatives 3 and 4 are a similar pair of proposals to Alternatives 1 and 2, except that the discount is at 10% and, in Alternative 3, the proposed fares to and from Sonoma County are \$.25 less than in the other alternatives. Alternatives 5 and 6 are termed the "variable toll" alternatives and involve a higher toll for single occupant autos. Both involve the same transit fare proposals as Alternative 1.

The environmental setting of the Proposed Action identifies the Golden Gate Bridge as a vital link in north-south coastal transportation and an important part of the federal and state highway network. The Golden Gate bus and ferry transit system is a sub-regional system confined within the Counties of Sonoma, Marin and San Francisco and a vital part of the regional transportation system. The Region's air quality should continue to improve as a result of the enforcement of auto emission standards but the incidence of smog conditions continues to be a serious problem. The financing of the Region's public transportation services is complex and a continuing serious problem for the Regional and local agencies. A related project, progressing simultaneously with the preparation of this report, is the Metropolitan Transportation Commission's proposal to raise tolls on other Bay bridges to provide revenues for support of the Region's transit services. MTC's "Environmental Impact Assessment Procedure" provides data on the Region's environmental resources.

The assessment of environmental effects was performed by consultants DeLeuw Cather & Company and is presented in Chapter 4. The consultants also prepared Appendix D on the Prospects for Continued Inflation and guided District staff concerning the needs of Appendix C on Estimation of Vehicle Emissions and Fuel Consumption. All other sections of the report were prepared by District staff.

There are two contexts in which the environmental effects are considered. The first involves comparison of the Alternative Proposals with "baseline" conditions which represent the hypothetical continuation of the transit services

at existing tolls and fares. Though it is understood that the baseline conditions are not a practical alternative for the District, use of this baseline permits identification of the immediate environmental consequences of the change and comparison among the alternatives. The second context involves comparison of the Alternative Proposals with the "no project" alternative; i.e., with the conditions which would prevail if there were no toll or fare increase. These conditions are simulated in general terms in Appendix A, using the District's Five-Year Financial Projections. They indicate that transit service reductions would be necessary before the end of FY 1977/78 and, if costs continued to inflate at about 6.0% per annum, further cuts would reduce services to some half or two-thirds of their present extent by 1981. While this comparison relates directly to the alternatives and financial decisions facing the District, the generalized nature of the concept for transit service reduction makes detailed analysis difficult. Based on this general concept, however, it is clear that the alternative to no increase in tolls or fares would result in greater traffic congestion, fuel consumption, vehicular emissions and personal hardship than any of the other alternatives considered.

The assessment of environmental effects developed through comparison with "baseline" conditions indicates that Alternatives 1, 3 and 4 would cause a small increase in traffic during the commute period and a compensating decrease in off-peak and weekend traffic. They would cause an increase in commute period congestion which, for Alternative 1, would amount to a maximum of 3 minutes per vehicle southbound, and 4.5 minutes northbound when totaled over all congested sections of the U.S. 101 corridor. This increase in a peak period congestion would be accompanied by minor increases in pollutant levels (particularly carbon-monoxide) in the vicinity of the congestion. Due to the reduced traffic in off-peak periods, Alternatives 1, 3 and 4 would have no net effect on energy consumption or regional air quality. Alternative 2, having no discount on tolls, would not increase commute period traffic, congestion or emissions. Alternative 2 would have a slightly beneficial effect on energy consumption and regional air quality. Alternatives 5 and 6 would make a more substantial, but still small, improvement in energy consumption and regional air quality and a substantial reduction in peak period congestion.

The consultants reviewed available knowledge and statistics to determine the potential impacts of the proposals on various socioeconomic groups. From this review, it appears likely that the proposed discounts would benefit high-income commuters more than the relatively lower-income, non-commuting travelers. Further, it is likely that due to the coincidence of a relatively large low-income, transit-dependent population in Sonoma County and the relatively large increases for Sonoma County based transit fares, the proposals might cause minor hardship for some Sonoma residents. The consultants found that the proposals, by increasing transportation costs, would have certain general influences on growth and land use patterns, but these influences would be insignificant. The proposals would lead to no noticeable increases in noise levels.

2.0 DESCRIPTION OF PROPOSED ACTION

The Golden Gate Bridge, Highway and Transportation District operates the Golden Gate Bridge as a toll bridge, operates ferry transit services between Marin County and San Francisco, and operates bus transit services on routes within and between San Francisco and Marin and Sonoma Counties. Bus transit services within Marin County and Sonoma County are provided under agreements with the two counties in which the counties determine the level of fares. The level of bus transit fares for trips extending beyond either Marin or Sonoma Counties, the level of ferry transit fares, and bridge tolls are determined by the District.

The District proposes to increase the bridge toll for automobiles,* together with an increase in fares for transit services between San Francisco and Marin and Sonoma Counties to be effective on July 1, 1977, or as soon as possible thereafter.

2.1 Location and Boundaries

The Golden Gate Bridge is a six-lane highway bridge spanning the Golden Gate Straits between Fort Point in San Francisco, California, and Lime Point in Marin County, California. Toll gates are located at the southern approach to the Bridge. Opened as a toll facility in 1937, the Golden Gate Bridge provides the only direct land based transportation connection between the San Francisco Peninsula and the north bay peninsula, comprised of Marin and Sonoma Counties. The location of the Golden Gate Bridge is shown in Figure 2-1. The relationship of the Bridge to the regional transportation network is described in Section 3.1.

The Golden Gate Ferry system operates the M.V. Golden Gate, a 15-knott, 575-passenger, diesel-powered vessel between San Francisco and the Golden Gate Ferry Landing in Sausalito, Marin County; and a fleet of 25-knott, 750-passenger, gas turbine-powered vessels between San Francisco and the Larkspur Ferry Terminal, in Marin County. Of the three turbine-powered vessels, the G.T. Marin entered service in December 1976, the G.T. Sonoma in February 1977, and the G.T. San Francisco is expected to enter service in September 1977.

The Ferry Landing in Sausalito is located on the waterfront adjacent to the intersection of Humboldt Street and Johnson Street. The facility has been in use by Golden Gate Ferries since 1971 and no major expansion or modification is planned. A parking area is located at Bridgeway and Marinship Way in Sausalito and connected to the Ferry Landing by a free shuttle bus, operating in coordination with the M.V. Golden Gate.

The Larkspur Ferry Terminal is located at the Bay shore some 2,000 feet east of the intersection of the U.S. 101 freeway and Sir Francis Drake Boulevard in Larkspur. It was opened for service in December 1976 with

*For definition of the toll category "automobiles" see Table 1.

boarding operations to date being performed from a temporary landing, pending the District's acceptance of the permanent landing facilities. The terminal includes full passenger amenities and parking for 535 vehicles, with a further 353 spaces planned. It includes boarding areas for feeder buses, taxis and private autos, administrative offices and maintenance facilities.

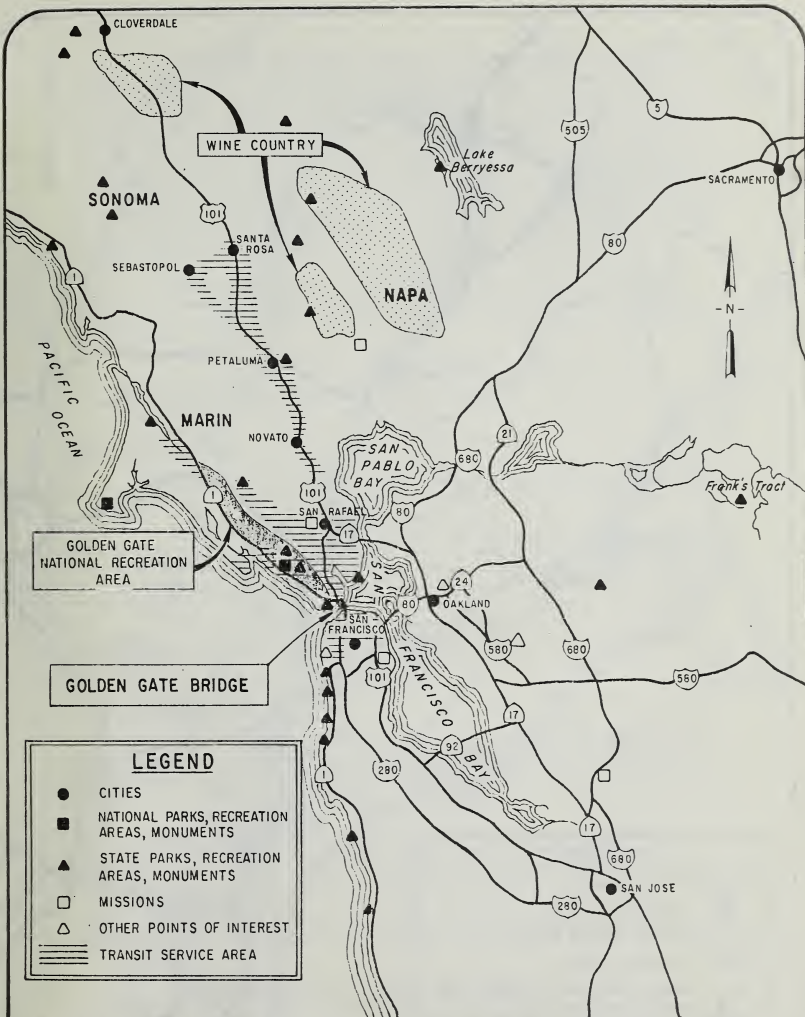
The new San Francisco Ferry Terminal is being constructed at a site behind the Ferry Building at the foot of Market Street in San Francisco and is due for completion in early 1978. The Terminal will have full passenger amenities and will serve both the Sausalito and Larkspur ferry services. In the interim the Sausalito and Larkspur ferry services are operating from separate, temporary facilities located a few hundred yards to the west of the new Ferry Terminal.

Feeder bus services, operated by Golden Gate Transit, connect certain Marin County neighborhoods with either the Sausalito or Larkspur ferries, and one service connects with a privately-owned ferry in Tiburon. The bus and ferry schedules are coordinated.

Golden Gate Transit operates a fleet of 248 buses on a route network extending from the San Francisco Civic Center and Financial District in the south* to Sebastopol and Santa Rosa in Sonoma County to the north. The transit service area and its relationship to local communities is shown in Figure 2-2. The central bus administration and maintenance facility is located at 1011 Andersen Drive in San Rafael, Marin County. Satellite facilities are located at Novato in Marin County; Petaluma and Santa Rosa in Sonoma County. The U.S. 101 freeway and its parallel service roads form the trunk facility of the 550-mile Golden Gate Transit route network. The various routes branch from the freeway to serve local communities. There are approximately 900 bus stops in the network. Each stop is identified by a standard sign and carries bus schedule information specific to the particular bus stop. Fifty-four of the more heavily patronized boarding points are supplied with bus shelters (twelve of these shelters were provided by the District), and an additional sixty-eight bus shelters are being constructed by the District in collaboration with local communities.

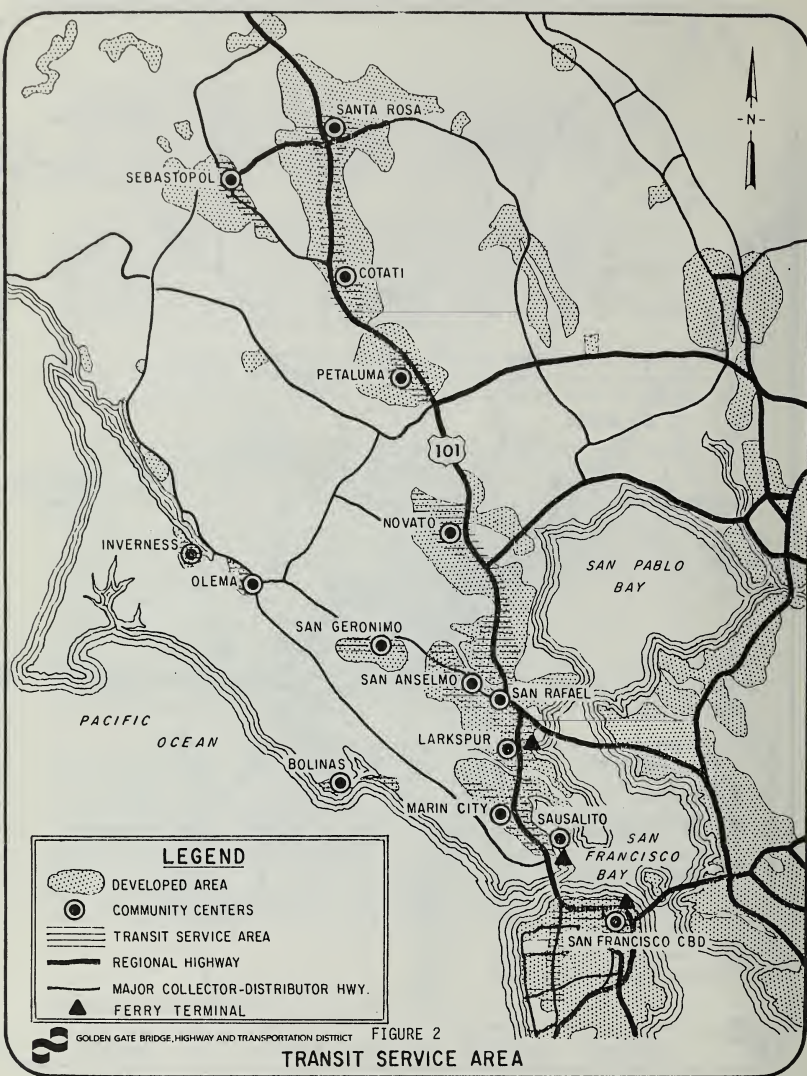
There are a number of major interchange points in the network. The San Francisco Transbay Terminal is the originating and terminating point for the majority of the Golden Gate Transit routes serving the San Francisco Civic Center and Financial District. The District is a principal participant in the development of this terminal (plans for development of the Transbay Terminal are discussed in Reference 3). The Transbay Terminal provides connections between Golden Gate Transit and the bus services of AC Transit, Samtrans, Amtrak and the San Francisco Airpporter. The major stop at 7th and Market Streets in San Francisco provides connections with BART and the San Francisco Greyhound Terminal. All stops within San Francisco afford convenient connections to San Francisco MUNI services.

*A weekend service connects to the San Francisco Zoo.



GOLDEN GATE BRIDGE, HIGHWAY AND TRANSPORTATION DISTRICT

GENERAL LOCATION OF THE GOLDEN GATE BRIDGE



At a major interchange point at the junction of Shoreline Highway (California State Route 1) and U.S. 101 in Manzanita, Marin County, bus schedules are synchronized to help interconnection between trunk routes and routes serving the communities of southern Marin County. Similarly, on a one-block section of 4th Street, beneath the U.S. 101 overpass in downtown San Rafael in Marin County, synchronized schedules provide interconnection between two trunk and two local routes. At both interchange points, shelter, public telephone and taxi service is available. The San Rafael interchange affords connection between Golden Gate Transit and the privately operated Traveler's Transit service to Richmond and the Richmond BART station in the East Bay. Golden Gate Transit connects with the bus transit services of the cities of Petaluma and Santa Rosa.

Parking facilities catering specifically to the Golden Gate Transit bus commuter are provided by the City of San Rafael in downtown San Rafael. In late 1977 a similar facility will be provided at Manzanita by CALTRANS.

2.2 Existing Tolls and Fares

2.2.1 Bridge Tolls

Bridge tolls are paid by vehicles passing in the southbound direction only. The present toll for automobiles is \$.75 per vehicle.

Convenience books of 20 tickets, each good for a single passage at any time during a given four-month period, are sold at face value during the first two months of each four-month period. Carpools (vehicles occupied by 3 or more persons) are permitted free passage during specified hours, Monday through Friday.

The existing toll charges for all categories of vehicles are shown in Table 2-1.

2.2.2 Transit Fares

Bus fares are paid in cash when boarding or leaving and exact fare is required. Passenger transfer between certain bus routes and at certain points is permitted, without additional charge, by use of a transfer ticket.

Ferry fares are paid in cash at ticket desks at the ferry terminals and on board the M.V. Golden Gate, which operates between San Francisco and Sausalito. The existing one-way ferry fare from Sausalito to San Francisco is \$.75; from Larkspur to San Francisco the fare is \$1.00.

Convenience books of 20 tickets are sold at face value and are accepted in lieu of cash fares on both buses and ferries for all trips to or from San Francisco.

Discount fares (set at approximately half the full fare) are offered to students, senior citizens and the handicapped on all bus commuter

services.* Children under five years of age accompanied by an adult and all blind persons are carried free of charge on all services.

The existing fare zones are shown in Figure 2-3. The existing fares and discount provisions are shown in Table 2-2.

2.3 Objectives of the Proposed Action

The objective of the proposed toll and fare increases is to raise additional revenues to permit the District to continue to operate its public transportation** services in fulfillment of its numerous policies, plans and commitments, while at the same time preserving adequate reserves for future repair, modification or improvement of the Golden Gate Bridge.

The basis of the District's policies, plans and commitments is laid out in the District's report to the California State Legislature dated September 1, 1975 entitled, "Golden Gate Corridor Transportation Facilities Plan Phase II" (Reference No. 2). This report was produced in response to a specific requirement of State Law (A.B. 919, Chapter 805, Statutes of 1969) and as required by that law, received the approval of the Metropolitan Transportation Commission (MTC)(MTC Resolution No. 227, July 23, 1975). The principal proposals of this Plan have been embodied in MTC's Regional Transportation Plan, as amended.

The Plan contains the following statements:

"From the beginning, the Directors of the Golden Gate Bridge, Highway and Transportation District have considered their first responsibility to be the maintenance, replacement and improvements necessary to keep the Golden Gate Bridge in prime condition."

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"All of the monies necessary to accomplish these (Bridge repair and improvement) tasks must come from revenues generated by the District.

There are no federal, state or local programs for funding assistance, and the District no longer has the authority to levy a property tax, nor has ever considered doing so.

* Commute service is defined as the service of 20 specific bus routes operating between Marin and Sonoma County neighborhoods and the San Francisco Financial District or Civic Center during the commute periods, Monday through Friday only, with service being to San Francisco only in the morning and from San Francisco in the evening commute periods.

** The District's public transportation services included its club bus, vanpool and carpool programs.

TABLE 2-1
EXISTING TOLL SCHEDULES

<u>CLASSIFICATION</u>	<u>CURRENT TOLL</u>
Auto, ambulance, hearse, motorcycle, tricar, or truck with single rear wheels, recreational vehicle	\$ 0.75
Convenience Book (20 tickets)(no discount)	15.00
Automobile or truck with trailer	1.50
2-axle truck with dual rear wheels	1.50
3-axle vehicle	3.00
4-axle vehicle	4.50
5-axle vehicle	6.00
6-axle vehicle	7.50
7-axle vehicle	9.00
8-axle vehicle	10.50
9-axle vehicle	12.00
Bus (15 or more occupants including driver)	2.00
Commuter Bus	.10
District vehicles, employees, directors, CHP, club buses	FREE
Extra axles	FREE
Military vehicles	FREE
Autos with 3 or more occupants between 6-10 a.m. Monday through Friday	FREE

TABLE 2-2

EXISTING TRANSIT FARE SCHEDULES AND DISCOUNT PROVISIONSEXISTING FARE SCHEDULE

<u>ZONE</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
1	.35					
2	.75	.35				
3	1.00	.35	.35			
4	1.25	.50	.50	.35		
5	1.50	.75	.75	.35	.35	

The DISCOUNT FARE is: one-half the cash fare rounded down to the nearest nickel.

The DISCOUNT FARE applies to:

STUDENT - age 6 through 21 with school I.D.*

SENIOR CITIZEN - age 65 or over with Bay Region
Transit Discount Card

HANDICAPPED - with Bay Region Transit Discount Card

The DISCOUNT FARE applies on:

All local routes - buses operating entirely within Marin County
(Routes 1, 7, 9, 21, 23, 27, 33, 39, 41, 43,
45, 47 and 49)

All basic routes - buses operating all day long, seven days a week
(Routes 10, 20, 50, 70, 80) and West Marin
(Routes 63 and 64)

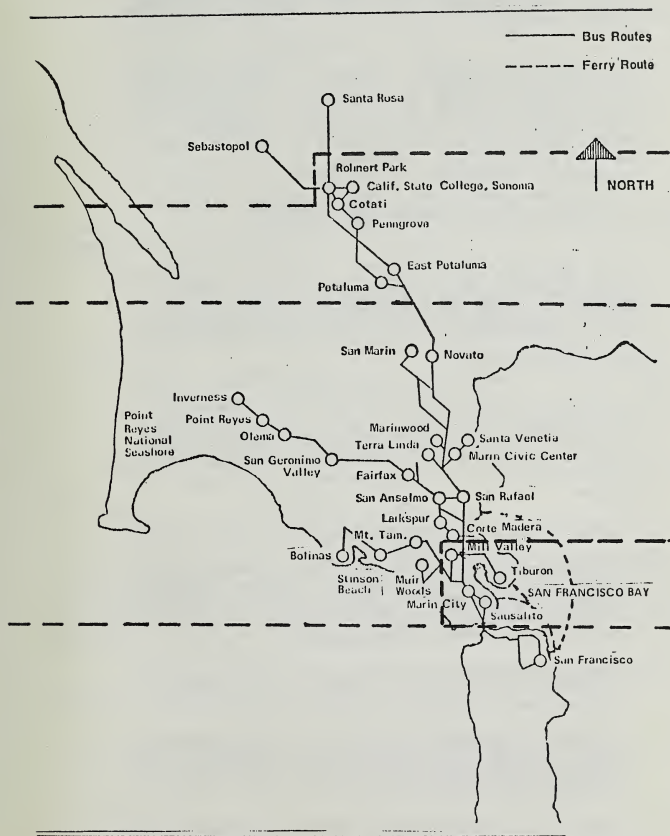
All ferry service

CHILDREN ages 5 and under ride free (limit of two (2) per accompanying adult)

BLIND persons with Bay Region Transit Discount Card (stamped "BLIND") or
Golden Gate Transit Blind I.D. card ride free on all routes

*Student discount fare in Marin and Sonoma Counties is \$.25.

FIGURE 2-3
EXISTING FARE ZONES



As heavy demands upon the District's resources continue to be made to meet the local share of capital grant allocations for mass transit facilities and equipment, and to subsidize transit operations, the District Directors are ever mindful of their first responsibility to keep the Golden Gate Bridge in prime condition."

...page 18

"Assuming that gasoline will continue to be available to the private driver at a price he is willing to pay, there will always be many who prefer to drive to work. Nevertheless, it is the goal of the Golden Gate Bridge, Highway and Transportation District to continue to manage the traffic growth by providing safe, comfortable, efficient and reasonably priced alternatives so that massive investment in new freeway capacity and in another transbay bridge will not be required for the Golden Gate Corridor."

...page 5

"In his appearance at the hearings (related to the UMTA grant for the District's ferry system), San Francisco's Mayor noted that San Francisco had agreed to the entry of the District's buses into San Francisco only upon the express condition that the District officially commit itself to the ferry component as well."

...page 14

"In the event an earthquake or other disaster should ever close the Golden Gate Bridge (or more likely, portions of U.S. 101 or overpasses on the San Francisco approach roads), the ferries could well be the only means of transporting people and goods between San Francisco and Marin until repairs are completed."

...page 15

"...the District's transportation development plans include"

- A. Implementation of expanded ferry service commencing in 1976 with a new Larkspur terminal, providing convenient transfer from feeder buses, terminal parking and frequent transbay service to accommodate increases in transit demand to the maximum extent feasible.
- B. Adoption of Golden Gate Corridor Study Board of Control recommendations relating to transportation planning in the San Francisco portion of the Golden Gate Corridor...
- C. Working with CALTRANS and Marin and Sonoma Counties and their cities for transit improvements including priority treatment and exclusive transit lanes on U.S. 101 or other exclusive rights-of-way.
- D. Cooperation with other transit operators and the Transbay Terminal Authority to maximize transit coordination and the opportunity for transfer between systems.

The District believes that by following these courses it will be meeting the future transportation needs of the commuter residents of the Golden Gate Corridor.

The programs set forth here are flexible and adaptable to changing conditions. They are not cost intensive, until at least the year 1985. From a financial standpoint, the District believes it is capable, within its own resources, and with existing state and federal financial aid programs for public transit, to achieve its goals through the year 1985. New funding from existing sources or added help from other sources will probably be necessary beyond that date. The District has the ability, through adjustments in its transit fares and Bridge tolls, to increase revenues to satisfy its financial needs."

...pages 32 and 33

The District has made additional policy commitments which provide the basis for determining its specific decisions relative to the management of traffic and transportation in the Golden Gate Corridor. These policies include:

By 1980, 50% of the persons traveling from Marin County to San Francisco during the peak hour of the morning commute period should be carried by public transportation.

Growth in travel during the peak hour of the morning commute period should be accomplished through growth in transit usage with no further growth in vehicular traffic.

Transit services should develop fare box revenues equal to at least half of their operating costs.

2.4 Characteristics of the Proposed Action

The District is considering several alternative combinations of toll and fare increases, as well as the possibility of not increasing either tolls or fares. The various toll and fare increase combinations include the possibility of selling convenience books of twenty (20) tickets (see Section 2.2.1), each ticket tenable as specified thereon, in lieu of an auto toll or transbay transit fare, at a discount of either 10% or 20% below the full cost of the tolls or fares.

On October 29, 1976, the Board of Directors instructed its staff to:

"prepare supporting data for preliminary environmental analysis based on the Five-Year Projections as submitted by the Auditor-Controller and General Manager, and that the toll and fare increases be analyzed on the bases of:

(a) no toll or fare increases;

(b) a 10% to 20% discount; and

(c) combinations thereof for years beginning July 1, 1977 and July 1, 1978..."

The report, "Initial Environmental Study of Proposed Toll and Fare Increases," was prepared by District staff and presented by the General Manager to the Board's Finance-Auditing Committee on April 7, 1977, and to the Board of Directors on April 8, 1977. (This Initial Study, in its entirety, is attached to the back of this report.) The Board then instructed staff to prepare a Draft Environmental Impact Report on the proposed toll and fare increases with prime focus to be directed on two alternatives (identified as Alternatives Nos. 2 and 3 in the Board's resolution) and that analysis be made of two other alternatives (identified as Alternatives Nos. 4 and 5 in the Board's resolution) and certain "variable toll" alternatives in which a higher toll would be charged for single-occupant vehicles during the 6:00 a.m. to 10:00 a.m. commute period. Two such variable toll alternatives have been chosen for analysis.

Six alternative toll increase, fare increase and discount combinations thus have been identified as "Alternative Proposals," within the scope of the Proposed Action. In Section 4 of this report, the environmental effects of the Alternative Proposals are assessed and compared. To the extent that it is meaningful, assessment is also made of the environmental effects of a generally conceived situation in which the minimal transit service cuts would be progressively introduced as an alternative to toll and fare increases. This situation is not an Alternative Proposal. This set of alternatives is identified in Table 2-3. The scope of all other alternatives is reviewed in Section 6. The six Alternative Proposals have the following components as described below.

2.4.1 An Increase in Tolls for Private Automobiles

The arrangements permitting certain government vehicles and commuter carpools to pass free would be retained. The toll structure for vehicles other than automobiles (Table 2-1) would be unchanged.

Under Alternatives Nos. 1 through 4, auto tolls would be increased from \$.75 to \$1.00. Under Alternatives Nos. 5 and 6, the increase would be effected by a different arrangement. The objective of the proposed auto toll increase is to raise necessary additional revenues.

2.4.2 A Variable Toll Structure

Under Alternatives Nos. 5 and 6, higher tolls would be charged for single-occupant automobiles as detailed in Table 2-3.

The objective of the Variable Toll Structure is to encourage ridesharing, and thereby contribute to environmental goals.

TABLE 2-3
CHARACTERISTICS OF TOLL AND FARE ALTERNATIVES
USED IN ASSESSMENT OF ENVIRONMENTAL EFFECTS

<u>ALTERNATIVE</u>	<u>CHARACTERISTICS</u>												
<u>ALTERNATIVE PROPOSALS--PRIME FOCUS</u>													
1	<u>Auto Toll</u> \$1.00 at all times except commute period carpools free. 20% discount on convenience books. <u>Transit Fares</u> Proposed 6 fare zones; Fare Schedule A. 20% discount on convenience books.												
2.	<u>Auto Toll</u> \$1.00 at all times except commute period carpools free. No discount on convenience books. <u>Transit Fares</u> Proposed 6 fare zones; Fare Schedule A. 20% discount on convenience books.												
<u>ALTERNATIVE PROPOSALS--OTHER</u>													
3	<u>Auto Toll</u> \$1.00 at all times except commute period carpools free. No discount on convenience books. <u>Transit Fares</u> Proposed 6 fare zones; Fare Schedule B. 10% discount on convenience books.												
4	<u>Auto Toll</u> \$1.00 at all times except commute period carpools free. 10% discount on convenience books. <u>Transit Fares</u> Proposed 6 fare zones; Fare Schedule A. 10% discount on convenience books.												
<u>ALTERNATIVE PROPOSALS--VARIABLE TOLL</u>													
5	<u>Auto Toll</u> With occupants per vehicle: <table> <tr> <td></td><td>1</td><td>2</td><td>3 & over</td></tr> <tr> <td>During commute period</td><td>\$1.50</td><td>\$0.75</td><td>Free</td></tr> <tr> <td>All other times</td><td>\$1.50</td><td>\$0.75</td><td>\$0.75</td></tr> </table> No discount on convenience books. <u>Transit Fares</u> Proposed 6 fare zones; Fare Schedule A. 20% discount on convenience books.		1	2	3 & over	During commute period	\$1.50	\$0.75	Free	All other times	\$1.50	\$0.75	\$0.75
	1	2	3 & over										
During commute period	\$1.50	\$0.75	Free										
All other times	\$1.50	\$0.75	\$0.75										
6	<u>Auto Toll</u> With occupants per vehicle: <table> <tr> <td></td><td>1</td><td>2</td><td>3 & over</td></tr> <tr> <td>During commute period</td><td>\$2.00</td><td>\$1.00</td><td>Free</td></tr> <tr> <td>All other times</td><td>\$1.00</td><td>\$1.00</td><td>\$1.00</td></tr> </table> No discount on convenience books. <u>Transit Fares</u> Proposed 6 fare zones; Fare Schedule A. 20% discount on convenience books.		1	2	3 & over	During commute period	\$2.00	\$1.00	Free	All other times	\$1.00	\$1.00	\$1.00
	1	2	3 & over										
During commute period	\$2.00	\$1.00	Free										
All other times	\$1.00	\$1.00	\$1.00										
<u>EXISTING TOLLS AND FARES--AND TRANSIT SERVICE REDUCTIONS</u> (Not on Alternative Proposal)													
7	<u>Auto Toll</u> \$0.75 at all times except commute period carpools free. No discount on convenience books. <u>Transit Fares</u> Existing 5 fare zones; Existing Fare Schedule. No discount on convenience books.												

NOTES:

1. This table identifies only those characteristics which serve to distinguish between the various toll and fare alternatives. For full details of toll schedules see Table 2-1, for fare zones see Figures 2-3 and 2-4, for fare schedules see Tables 2-2 and 2-4.
2. Commute period is 6:00 A.M. thru 10:00 A.M., Mondays thru Fridays.
3. "CARPOOLS" are automobiles with 3 or more occupants.
4. Convenience books of 20 tickets tenable in lieu of tolls or transbay fares and sold at a possible discount below full cost of the tolls or fares.

2.4.3 An Increase in Transit Fares

Fares would be increased for all intercounty bus or ferry transit trips and Golden Gate Transit bus trips within San Francisco.

The objective of the proposed fare increases is to raise necessary additional revenues and to comply with District policy that the farebox revenues of a transit service should cover 50% of the service's operating costs.

Golden Gate Transit bus fares between San Francisco and the Golden Gate Bridge Toll Plaza would increase from \$.35 to \$.50. The minimum fare increase for intercounty trips, by bus or ferry, would be \$.25 with larger increases applicable to certain trips as detailed below.

The set of fare zones would be redefined as shown in Figure 2-4. (For existing fare zones see Figure 2-3.) Two alternative transit fare schedules are featured in the various Alternative Proposals. They are detailed as Schedules A and B in Table 2-4.

2.4.4 An Additional Fare Zone

The existing Zone 3 would be divided into two new zones, with the new Zone 3 covering central Marin and the new Zone 4 covering northern and western Marin. Thus, fares for trips to or beyond the new Zone 4 would be increased by an additional \$.25.

The objective of the proposed additional fare zone is to make fares more accurately reflect the additional operating costs associated with trip length.

2.4.5 Zone 3 to Include Tiburon

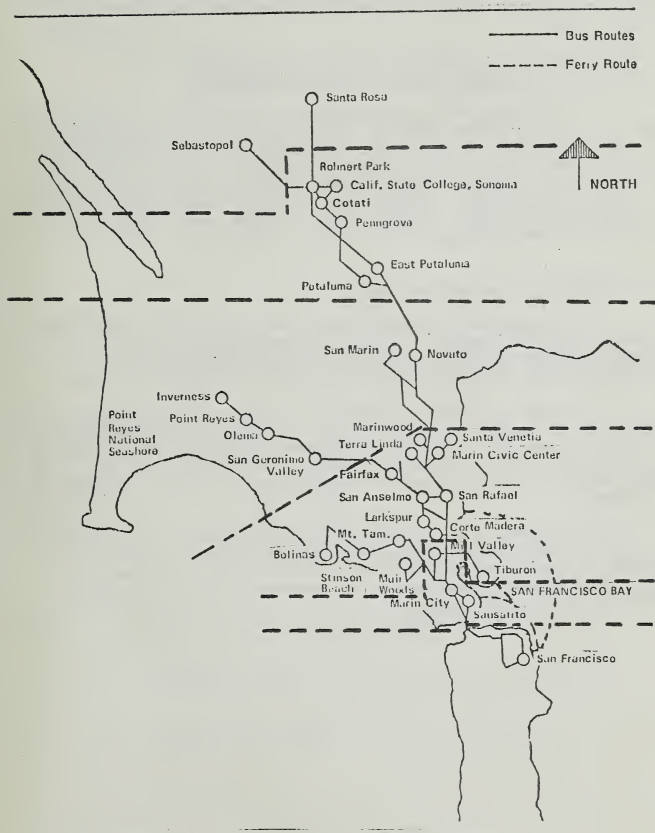
By redefining the boundary between Zone 2 and Zone 3, the Tiburon Peninsula is included within Zone 3 in the proposed new set of fare zones. Thus, fares between San Francisco and Tiburon would be increased by an additional \$.25.

The objective of this proposed zone adjustment is to make fares more accurately reflect the additional operating costs associated with trip length.

2.4.6 Additional Increase--Sonoma County

In addition to the above-described increases, an increase of \$.25 is proposed for trips to or from Sonoma County. This additional increase is included in Proposed Fare Schedule A, but not included in Proposed Fare Schedule B and is the sole distinction between Schedules A and B (Table 2-4).

FIGURE 2-4
PROPOSED FARE ZONES



6

5

4

3

2

1

Schedule A is included in Proposed Alternatives Nos. 1, 2, 4, 5 and 6.
Schedule B is included in Alternative No. 3.

The objective of the additional Sonoma County increase is to make fares more accurately reflect the additional operating costs associated with trip length.

2.4.7 Additional Increase--Sausalito Ferry on Weekends

In addition to the above-described increases, it is proposed that fares on the Sausalito-San Francisco ferry service on Saturdays, Sundays and public holidays be increased by an additional \$.25 to \$1.25 each way. Convenience book tickets (see Section 2.4.8) tenable for the weekday fare of \$1.00 would be accepted without further charge on weekends and holidays. This additional increase is included in each of the six Alternative Proposals. Its objective is to offer a standard fare for recreational ferry riders originating in San Francisco.

2.4.8 Discounts for Convenience Books

It is proposed that convenience books of 20 tickets, each ticket tenable as specified thereon, in lieu of the proposed \$1.00 auto toll or in lieu of a specific transbay transit fare or either, would be sold at a discount of either 10% or 20% below the full cost of the tolls or fares.

The sale of convenience books at a discount for payment of Bridge tolls is included in Alternative No. 1 (a 20% discount) and Alternative No. 4 (a 10% discount). Such sale for payment of transbay transit fares is included in each of the Alternative Proposals, with Alternatives Nos. 1, 2, 5 and 6 proposing a 20% discount and Alternatives Nos. 3 and 4 proposing a 10% discount.

The objective of the convenience book discounts is to reduce the financial burden on frequent users of the Bridge and transit services. A secondary objective of discounts on convenience books for payment of tolls is to encourage greater use of the convenience books which improve traffic flow at the toll gate.

TABLE 2-4

PROPOSED ALTERNATIVE TRANSIT FARE SCHEDULESSCHEDULE A

<u>Proposed Fare (Dollars) For One-Way Trip Between Zones</u>							
	<u>ZONE</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
San Francisco	1	.50					
Southern Marin	2	1.00 (3)	.35				
Central Marin	3	1.25	.35	.35			
Western & Northern Marin	4	1.50	.35	.35	.35		
Southern Sonoma	5	2.00	1.25	1.00	.75	.35	
Central Sonoma	6	2.25	1.50	1.25	1.00	.35	.35

SCHEDULE B

<u>Proposed Fare (Dollars) For One-Way Trip Between Zones</u>							
	<u>ZONE</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
San Francisco	1	.50					
Southern Marin	2	1.00 (3)	.35				
Central Marin	3	1.25	.35	.35			
Western & Northern Marin	4	1.50	.35	.35	.35		
Southern Sonoma	5	1.75	1.00	.75	.50	.35	
Central Sonoma	6	2.00	1.25	1.00	.75	.35	.35

- NOTES:
1. Discount provisions are unchanged by proposed fare increase (see Table 2-2).
 2. Proposed discounts on sale of convenience books detailed in Table 2-3.
 3. Sausalito Ferry cash fare \$1.25 on Saturdays, Sundays and Holidays.

3.0 ENVIRONMENTAL SETTING

Two highways provide the principal connection between San Francisco and the coastal regions of California. California State Route 1 closely follows the Pacific coastline from southern California along the San Francisco Peninsula, across the Golden Gate Bridge and northward along the coastline to Oregon. U.S. Route 101 follows the most populated valleys within the Coastal Range from southern California, then along the western shores of San Francisco Bay across the Golden Gate Bridge and continues along the western Bay shore and the valleys of the Coastal Range, to join State Route 1 some 160 miles north of San Francisco. With the opening of the Golden Gate Bridge in 1937, these routes rapidly became the principal connections between the timber, wine, agricultural and recreational industries of the counties north and south of San Francisco. The location of major agricultural and recreational areas in the vicinity of the Golden Gate Bridge is shown in Figure 2-1.

The State's principal north-south highway, Interstate Route 5, is located along the San Joaquin Valley, east of the San Francisco Bay Area. The principal route eastward from the San Francisco Bay Area, Interstate Route 80, is located along the eastern Bay shores. The most direct connections to these routes from the Bay Area's major population areas do not cross the Golden Gate Bridge. Thus, the Golden Gate Bridge is predominantly a link in the north-south coastal highway network.

While vehicles crossing the Golden Gate Bridge originate from and are destined for all parts of the North American Continent, there is generally a greater use of the facility by vehicles originating from points of closer proximity. The most recent survey of users by place of vehicle registration is shown in Table 3-1. Approximately 79% of the Golden Gate Bridge users reside in four counties of the nine-county Bay Area.

The topography of the Bay Area has been a major factor in the development of the Region's urban areas and its transportation system. It influences airflow patterns which determine the location, frequency and severity of air pollution problems (Reference 13, page 1.2.p.1).

A characteristic of the Region's topography is the linear trend toward a northwest-southwest alignment. The ridges and valleys tend to run parallel to each other along this alignment (see Figure 3-1). The largest and most important single feature of the topography is the San Francisco Bay which extends into San Pablo and Suisun Bays. Together they form a contiguous body of tidal water some 50 miles long and variously from two to twelve miles wide, with its longer axis paralleling the Pacific coastline. The bays receive the flows of the Sacramento River from the northeast, and various lesser waterways, and open to the Pacific Ocean at the mile-wide, 350-deep Golden Gate Straits, over which the Golden Gate Bridge spans.

The principal cities of the Bay Area's nine-county Region are San Francisco, Oakland, and San Jose. Seventy percent of the Region's 4.8 million population is located on the Bay Plain lands which adjoin the

TABLE 3-1
DISTRIBUTION OF GOLDEN GATE BRIDGE USERS
BY COUNTY OF VEHICLE REGISTRATION

	<u>Marin</u>	<u>S.F.</u>	<u>San Mateo</u>	<u>Sonoma</u>	<u>Other Ca.</u>	<u>Out of State</u>	<u>Total</u>
Commute 6/10 A.M.	64.1	11.4	2.7	9.3	9.9	2.6	100%
Weekday	48.4	16.9	7.1	8.5	14.6	4.5	100%
Saturday	32.6	21.7	11.9	8.7	21.6	3.5	100%
Sunday	21.6	29.8	16.5	6.0	21.6	4.5	100%
Overall	42.6	19.3	9.0	8.2	16.5	4.4	100%

SOURCE: GGBHTD License Plate Survey of Southbound Revenue Traffic
March 21 through 27, 1977
Sample Size: 28,240 vehicles

NOTE: To the extent that some vehicles may be registered through a place of employment, or through a lessor, some overstatement of the number of users "residing" at principal employment centers is anticipated.

FIGURE 3-1. SAN FRANCISCO BAY AREA - SHADED RELIEF MAP



SOURCE: Reference 13, page 1.2.p.2.

Bay shoreline. The greatest concentration of population is on the lands along the West Bay between San Francisco and San Jose and along the East Bay between San Jose, Oakland and Vallejo (Reference 12, pages 27 and 28). The county-wide distribution of the Bay Area's population and land area is given in Table 3-2.

The establishment of the Golden Gate Bridge as a highway link between the north and south Bay areas has promoted the suburbanization of the valleys north along Route 101. Convenient highway travel reduced the predominance of the railroads and their connecting ferry services in the transportation of goods and people. A branch freight service currently operates north of San Rafael. However, the service in a number of locations is proposed for abandonment (References 5 and 6).

The Golden Gate Bridge, Highway and Transportation District provides public transportation in the Golden Gate Corridor along the northwestern shores of the Bay. The service area of the Golden Gate Transit system is shown in Figure 2-2. It extends from San Francisco, across the Golden Gate Bridge and follows U.S. Route 101 connecting the principal population centers of Marin and Sonoma Counties as far north as Santa Rosa and Sebastopol. Branches extend from U.S. 101 along the more populated valleys of Marin County. Special commuter and recreational bus services operate in the rural areas of West Marin.

The Bay Area Rapid Transit District (BARTD) and AC Transit bus services provide public transportation services in the East Bay Corridor and connections between East Bay and San Francisco. The Southern Pacific Railroad, the San Mateo County Transit District, the Santa Clara County Transit District, and other bus operators provide public transportation in the West Bay Corridor south of San Francisco.

3.1 Golden Gate Bridge and Regional Highway Travel

Historic trends in Golden Gate Bridge vehicular traffic are illustrated in Figure 3-2. Vehicular traffic increased at approximately four percent per annum between 1950 and 1970, then remained approximately constant from 1970 to 1975. In 1976, growth appears to have resumed with about 34,870,000 vehicles crossing the Bridge. On a typical day in December 1976, almost 100,000 vehicles (two-way ADT, average daily traffic) passed over the Bridge. At the same time, approximately 20,000 vehicles, almost 40% of total daily southbound traffic, traveled southbound during the morning commute hours (6:00 to 10:00 a.m.) on a typical day (Reference 14, pages 22, 34).

In addition to the Golden Gate Bridge between Marin and San Francisco Counties, there are six other Bay crossings: The Benecia-Martinez (Interstate Route 680; 38,000 ADT) and Carquinez (Interstate Route 80; 56,000 ADT) Bridges between Contra Costa and Solano Counties, the San Rafael-Richmond Bridge (State Route 17; 23,000 ADT) between Marin and Contra Costa Counties, the San Francisco-Oakland Bay Bridge (Interstate Route 80; 180,000 ADT) between Alameda and San Francisco Counties, and the San Mateo-Hayward (State Route 92; 30,000 ADT) and Dumbarton (State Route 84; 12,000 ADT)

TABLE 3-2

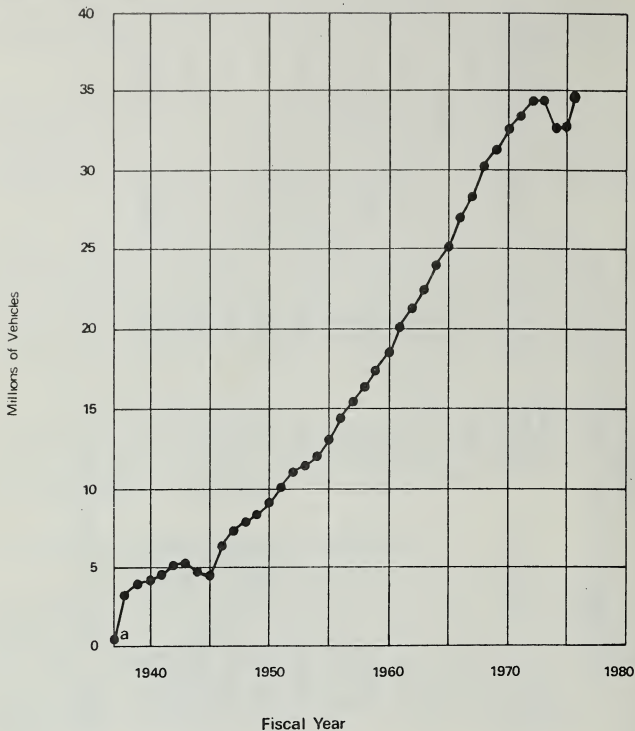
SAN FRANCISCO BAY AREA POPULATION AND LAND AREA

County	County's Population In Basin-1970	% of Basin's Population	% of County's Population In Basin	Area In Basin (Mi ²)	% of Basin's Land Area	Population Density (Persons/Mi ²)
ALAMEDA	1,063,800	23.5	100	733	13.2	1,451
CONTRA COSTA	558,100	12.3	100	733	13.2	761
MARIN	203,300	4.5	100	520	9.4	391
NAPA	79,400	1.8	100	787	14.2	101
SAN FRANCISCO	699,200	15.4	100	45	0.8	15,338
SAN MATEO	556,000	12.3	100	447	8.1	447
SANTA CLARA	1,070,000	23.6	100	1,300	23.4	823
SOLANO	124,500	2.7	79	358	6.5	348
SONOMA	178,900	3.9	87.2	620	11.2	289
TOTAL	4,533,200	100.0		5,543	100.0	818

SOURCE: Reference 4, page II-3.

Bridge Vehicle Traffic by Year

1937 to the Present



Notes:

- Represents vehicle traffic from May 28, 1937 (bridge opening) to June 30, 1937.
- Traffic during current fiscal year 1975-76:
through June 1976: 34,871,856 vehicles.

SOURCE: Reference 14, page 41.

Bridges between Alameda and San Mateo Counties.* Each Bay crossing constitutes a critical link in the regional transportation network. See Figure 3-3 for the location of these bridges and other critical links in the regional transportation network. All of the bridges are under the control of the California Toll Bridge Authority except the Golden Gate Bridge which is owned and operated by the Golden Gate Bridge, Highway and Transportation District.

MTC, in its Regional Transportation Plan (Reference 12), separates the region into transportation corridors (see Figure 3-4). The Golden Gate Bridge and most related travel (see Table 3-1 in Section 3.0 for the spatial distribution of bridge users) are part of the Golden Gate and Marin-Sonoma Coast Corridors. The Golden Gate Corridor links the urbanized areas of Marin and Sonoma Counties with San Francisco. U.S. Route 101 provides freeway service through Sonoma and Marin to the Golden Gate Bridge. Average daily traffic volumes on Route 101 are listed in Table 3-3.

The Marin-Sonoma Coast Corridor includes the undeveloped valleys of Marin, and the coastal recreation areas of Marin and Sonoma Counties. Highway access is provided by State Route 1 in a north-south direction connecting the area to Route 101 in the southern part of the corridor. East-west connections to Route 101 are provided by Routes 12, 17, 37 and 116 (see Figure 3-5). Average daily traffic volumes along these routes are listed in Table 3-3.

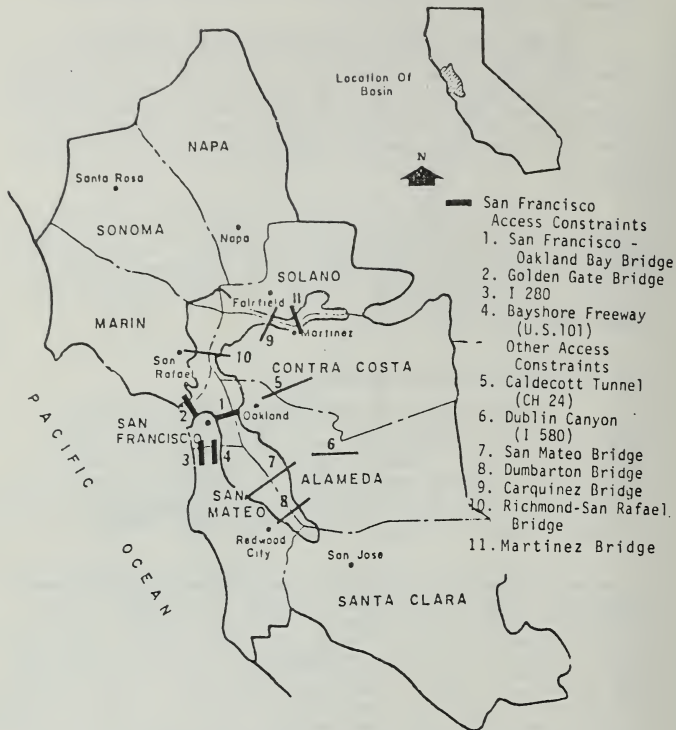
3.2 Golden Gate Transit and Regional Transit

A description of the Golden Gate bus and ferry systems is given in Section 2.1 of this report. The Golden Gate Transit service area is illustrated in Figure 2-2. A map of the Golden Gate Transit bus and ferry systems is shown in Figure 2-3. In general, Golden Gate Transit provides transbay service between Marin and Sonoma Counties and San Francisco. Golden Gate Transit buses provide local service to portions of Marin County on a contract basis with the Marin County Transit District. A history of transit patronage is shown in Table 3-4.

The principal components of the regional transit network are illustrated in Figure 3-6. In addition to Golden Gate Transit, Greyhound and a number of private charter bus companies also serve the north-west Bay transportation corridors. Harbor Tours provides additional ferry service between Marin and San Francisco and Alameda Counties. The largest transit operators in the region, namely, San Francisco Municipal Railway (MUNI), Alameda-Contra Costa Transit (AC Transit), and San Francisco Bay Area Rapid Transit (BART), carried approximately 170.1 million**, 52.3 million, and 32.9 million passengers respectively in FY 1975/76. In the Peninsula Corridor, the Southern Pacific and Greyhound lines carried about 4.3 million and 3.4 million passengers respectively in 1975*** and San Mateo County Transit carried about 3.3 million passengers in FY 1975/76.

*Bridge ADT taken from References 8 (page 29) and 15; **Includes 50 million non-revenue passengers; ***S.P. annual passengers = daily passengers x 290/ Greyhound annual passengers = daily passengers x 340. NOTE: Patronage figures supplied by Pat Hackett, MTC, from MTC Annual TDA Report for FY 1975/76 and from Peninsula Transit Alternatives Project studies.

FIGURE 3-3
CRITICAL LINKS IN THE BAY AREA TRANSPORTATION NETWORK



SOURCE: Reference 4, page II-5.

TRANSPORTATION - LAND USE CORRIDORS

The map illustrates the San Francisco Bay Area with various transportation and land use corridors. Key features include:

- Counties:** SONOMA, MARIN, NAPA, SACRAMENTO, CONTRA COSTA, ALAMEDA, SANTA CLARA, SAN FRANCISCO, SAN MATEO, SAN JOSE.
- Cities and Towns:** Cloverdale, Cazadero, Napa, Fairfield, Pittsburg, Walnut Creek, Livermore, Fremont, Sunnyvale, Santa Clara, San Jose, San Mateo, San Bruno, Daly City, San Francisco, San Leandro, San Ramon, Richmond, Berkeley, Oakland, Novato, Petaluma, Santa Rosa, San Rafael.
- Corridors:** SONOMA-GOLDEN GATE, MARIN-SONOMA COAST, NAPA VALLEY, SACRAMENTO, CONTRA COSTA, EAST BAY, WEST BAY, SAN MATEO COAST, SAN JOSE VALLEY.
- Geographical Features:** PACIFIC OCEAN, SAN FRANCISCO BAY.
- Legend:** TRANSPORTATION - LAND USE CORRIDORS.
- North Arrow:** north.

3 - 9

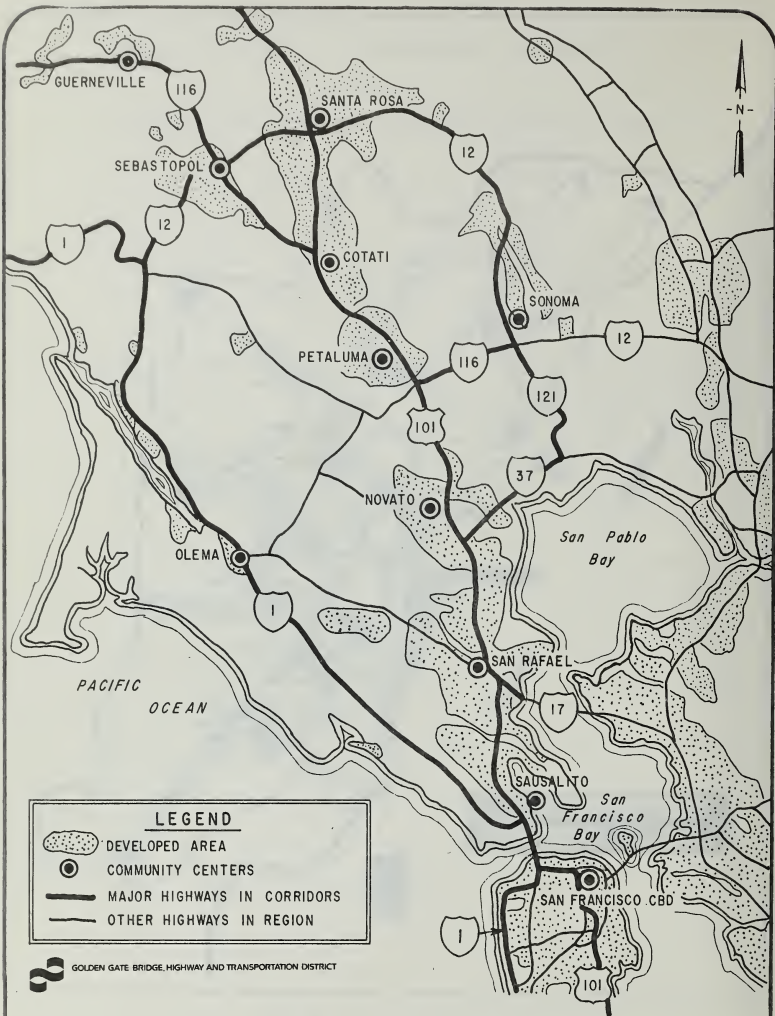


FIGURE 3-5. MAJOR HIGHWAYS IN THE GOLDEN GATE AND MARIN-SONOMA COAST CORRIDORS

TABLE 3-3

AVERAGE DAILY TRAFFIC ON SEGMENTS OF MAJOR HIGHWAYS IN
THE GOLDEN GATE AND MARIN-SONOMA COAST CORRIDORS

<u>ROUTE</u>	<u>SEGMENT</u>	<u>ADT</u>
U.S. 101	Santa Rosa - Novato	30,000 - 50,000
	Novato	70,000
	San Rafael - Golden Gate Bridge	90,000 - 110,000
	San Francisco Arterial Streets	45,000 - 60,000
S.R. 1	North of Junction with U.S. 101	1,000 - 4,000
	At Junction with U.S. 101	25,000
	Through San Francisco	45,000 - 60,000
S.R. 12	Sebastopol - Santa Rosa	12,000 - 30,000
	Santa Rosa - Sonoma	8,000 - 15,000
S.R. 17	Junction with U.S. 101 - Richmond Bridge	25,000
S.R. 37	Through Marin and Sonoma Counties	10,000 - 20,000
S.R. 116	Guerneville - Sebastopol	5,000 - 10,000
	Sebastopol - Junction with U.S. 101	7,000 - 16,000
	Junction with 101 - Junction with S.R. 121	2,000 - 11,000

SOURCE: Reference 15

3.3 Climate and Air Quality

Most of the nine-county San Francisco Bay Area, all of Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, Napa, and portions of Solano and Sonoma, comprise the San Francisco Bay Intrastate Air Quality Control Region (AQCR). The maintenance of air quality in the AQCR is the responsibility of the Bay Area Air Pollution Control District (BAAPCD).

The San Francisco Bay Area climate is typical of California coastal zones. Most summer days are dry and sunny. Spring weather is variable. Late fall and winter are cool and windy and receive most of the area's moderate rainfall. Wind patterns vary with location, time of day and season (see Figure 3-7). The most frequent daytime pattern is a moderate sea breeze off the coast and Bay. The wind direction frequently reverses to a land breeze in the evening. Air movement and stability are usually dominated by the Pacific high pressure zone. Light winds and downward vertical flow caused by high pressure areas, combined with the topography of the Bay Area, a large shallow basin ringed by hills, can result in a heavy build-up of photochemical smog (Reference 4, page II-6).

Photochemical smog (in particular, ozone (O_3) or oxidant) results from a chemical reaction in the atmosphere between oxides of nitrogen (NO_x as NO_2) and reactive organic gases (primarily reactive hydrocarbons (RHC)) under the influence of sunlight.

Under the weather conditions causing "inversion", pollution may be the heaviest. Inversion is characterized by a cool layer of air trapped below a layer of warm air, a reversal of the atmosphere's normal decrease of temperature with altitude. Summer inversions are caused by downward vertical motion (subsidence) which compresses and heats the air. Winter inversions are formed as air warmed by radiation is cooled as it comes in contact with the earth's cold surface at night. Both types may combine during the fall, resulting in the worst pollution. The inversion prevents pollutants from diluting in the vertical air mass and confines them to air that is breathed.

The inversion and wind speed together determine the total volume of air available to dilute the pollutants. Poor ventilation usually creates a "smog season" during the warm and sunny months from May to October (see Figure 3-8). The smog (oxidants) problem occurs some distance downwind from the sources of the pollutants because of the time required to photochemically produce O_3 .

Unlike the pollutants that combine to form photochemical oxidant, carbon-monoxide (CO) is relatively inert. It disperses quickly away from its source and so is more of a problem near its source. CO reaches peak levels in the late fall and winter due to surface-based temperature inversions, increases space heating requirements and mobile sources. There are other air pollutants, notably sulfur oxides, hydrogen sulfide, fluoride and particulate matter. However, CO and O_3 (from NO_x and RHC) are the major types of air pollution in the Bay Area (Reference 9). Tables 3-5 and 3-6 give breakdowns of regional air pollution by source and by county.

TABLE 3-4
DISTRICT TRANSIT PATRONAGE
(Thousands of Riders)

<u>YEAR</u>	<u>BASIC</u>	<u>LOCAL</u>	<u>COMMUTER</u>	<u>FERRY*</u>	<u>TOTAL</u>
1973	2,343	1,366	3,391	1,019	8,119
1974	3,343	1,760	3,501	1,094	9,698
1975	3,379	1,995	4,068	1,091	10,533
1976**	2,909	1,551	3,343	1,103	8,906
1976***	3,636	1,938	4,178	1,103	10,855

SOURCE: GGBHTD Monthly Passenger Summary Report for Years 1973 thru 1976.

* Sausalito Ferry Only

** Bus Transit Strike (4-12-76 thru 6-14-76)

*** 1976 figures adjusted upward 25% to eliminate effect of strike and temporary loss of passengers.

Definition of Services:

Basic: Buses operating all day, seven days a week, on transbay routes to San Francisco Civic Center

Local: Buses operating entirely within Marin County under contract with Marin County Transit District.

Commuter: Direct service to and from San Francisco CBD and Civic Center during commute hours only.

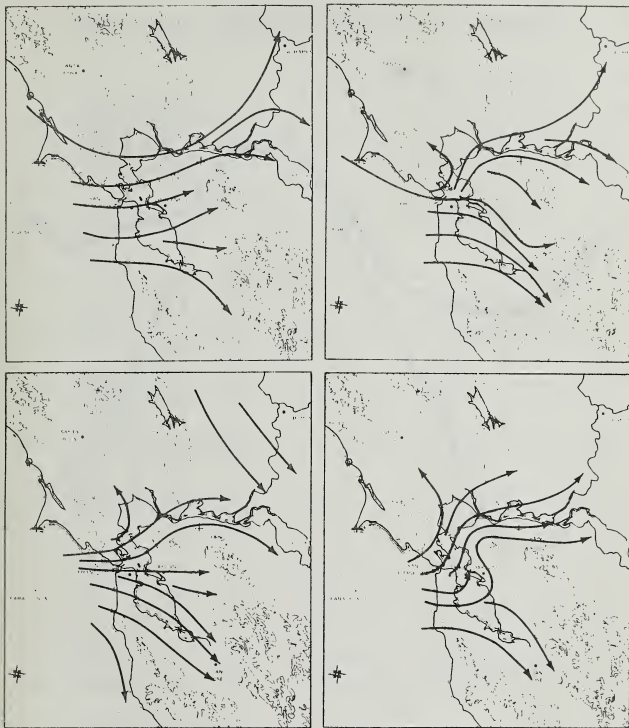
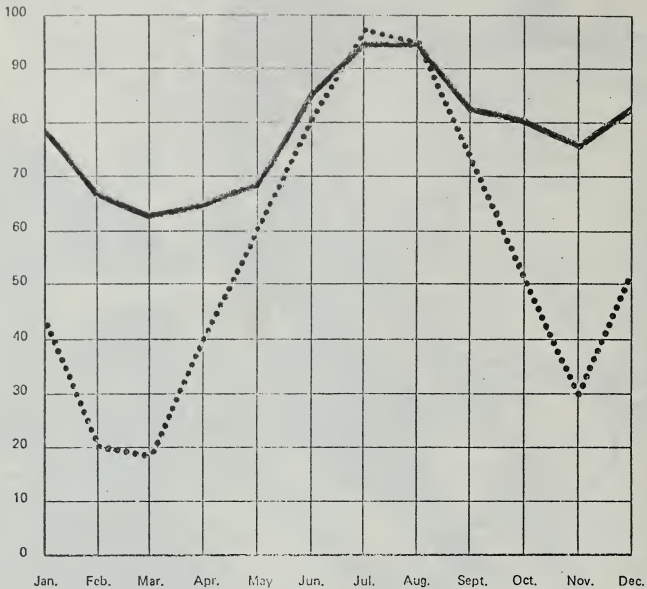


FIGURE 3-7. MOST COMMON DAYTIME AIRFLOW PATTERNS IN THE SAN FRANCISCO BAY AREA

SOURCE: Reference 7, page IV. B. 1(B)-2.

FREQUENCY OF INVERSIONS, 1957-1967

per cent



— 0400 PST

••••• 1600 PST

—percentage frequency of inversions, below 2000 feet or less by month based on Oakland radiosonde data for the period 1957-1967

SOURCE: Reference 8, Appendix B, page 10.

TABLE 3-5

1975 BAAPCD AREA-WIDE

ANNUAL AVERAGE EMISSIONS

	TONS/DAY				
	Part.	Org.	NO _x	SO ₂	CO
PETROLEUM REFINING					
Refining Processes	1.4	1.8	5.6	31	--
Other Processes	0.8	22	--	2.9	--
Combustion for Heat	3.7	4.6	39	8.6	0.4
Storage & Blending	--	35	--	--	--
Marine Loading	--	11	--	--	--
Upsets, Breakdowns, Flaring	0.3	1	0.3	5.3	--
CHEMICAL					
Nitric Acid	--	--	2.9	--	--
Sulfur	0.3	0.2	--	62	9.1
Sulfuric Acid	0.1	--	0.1	21	--
Other Chemical	4.5	5.3	--	0.8	28
OTHER INDUSTRIAL/COMMERCIAL					
Pulp and Paper	0.8	0.6	0.6	--	22
Metallurgical	2.9	--	--	--	--
Mineral	28	0.1	1.9	5.9	--
Other Processes	43	9.5	--	--	--
ORGANIC COMPOUNDS EVAPORATION					
Storage Tanks	--	17	--	--	--
Coating Operations	--	150	--	--	--
Degreasers	--	43	--	--	--
Dry Cleaners	--	15	--	--	--
Rubber, Plastic Product Mfg.	--	48	--	--	--
Other Organics Evaporation	--	34	--	--	--
GASOLINE MARKETING					
Bulk Loading Plants	--	16	--	--	--
Service Stations-Spillage	--	3.9	--	--	--
-Underground Tanks	--	6.3	--	--	--
-Filling Auto Tanks	--	35	--	--	--
COMBUSTION OF FUELS					
Domestic	4.4	0.2	22	--	1.2
Commercial & Institutional	1.3	0.1	6.5	--	0.3
Utilities-Power Plants	4.6	0.3	65	28	0.1
Other Industrial	2.4	3	63	6.8	16
BURNING OF MATERIALS					
Incineration	1.7	2.9	0.6	0.2	8.1
Agricultural Open Burning	1.5	3.8	0.1	0.1	7.5
Accidental Fires	9.6	13	0.6	--	42
OFF-HIGHWAY MOBILE SOURCES					
Agricultural Tractors	0.8	3.7	8.5	1.4	56
Construction Equipment	2.8	6.9	39	5.2	99
Ships	0.7	1.5	4.9	18	0.8
Locomotives	0.4	1.7	5.3	0.8	1.9
Other Engines	0.4	31	2.1	0.2	120
TOTAL (DISTRICT JURISDICTION)	120	530	270	200	410
AIRCRAFT					
Air Carriers	5.2	9.9	8.5	0.8	20
General Aviation	0.8	4.4	1.5	--	21
Military	3	5.4	3.5	0.4	13
MOTOR VEHICLES					
Cars & Light-Duty Trucks	41	330	290	11	2400
Heavy-Duty Trucks	6.9	120	75	8.8	700
Buses	0.5	1.8	7.3	1.1	10
Motorcycles	0.3	14	0.3	--	51
GRAND TOTAL	180	1000	660	220	3700

SOURCE: Reference B, Appendix B, page 12

TABLE 3-6

EMISSIONS BY COUNTY--1973

All values below are shown to only 2 significant figures as an indication of their certainty. Because of independent rounding, totals may not always equal exactly the sums of their parts.

	TONS/DAY				
	Part.	Org.	NO _x	SO ₂	CO
ALAMEDA					
District Sources	18	130	30	13	42
Transportation	11	160	120	4	1000
Total	29	290	150	17	1000
CONTRA COSTA					
District Sources	28	140	130	170	55
Transportation	4	57	45	1	360
Total	31	200	180	170	420
MARIN					
District Sources	4	17	4	1	8
Transportation	3	38	29	1	240
Total	7	54	33	1	250
NAPA					
District Sources	6	13	3	1	24
Transportation	1	11	8	-	68
Total	6	24	11	1	91
SAN FRANCISCO					
District Sources	16	77	29	8	23
Transportation	3	53	41	1	340
Total	20	130	70	10	360
SAN MATEO					
District Sources	12	71	11	2	34
Transportation	9	80	61	2	470
Total	22	150	72	4	500
SANTA CLARA					
District Sources	14	130	51	5	42
Transportation	12	150	120	4	950
Total	26	280	170	9	990
SOLANO					
District Sources	7	26	21	41	14
Transportation	4	36	28	1	220
Total	11	62	49	42	230
SONOMA					
District Sources	6	19	3	1	18
Transportation	3	41	32	1	260
Total	9	60	36	2	280
TOTAL/NINE COUNTIES					
District Sources	110	620	290	240	260
Transportation	49	630	490	16	3900
Total	160	1200	780	260	4200

	PERCENT Distribution of Emissions				
	Part.	Org.	NO _x	SO ₂	CO
ALAMEDA	18	23	20	6	25
CONTRA COSTA	19	16	23	67	10
MARIN	4	4	4	1	6
NAPA	4	2	1	-	2
SAN FRANCISCO	12	10	9	4	9
SAN MATEO	13	12	9	2	12
SANTA CLARA	16	23	22	4	24
SOLANO	7	5	6	16	6
SONOMA	6	5	5	1	7
TOTAL	100%	100%	100%	100%	100%

3.4 Land Use Patterns

Regional Development (Reference 13, pages I.1.p.1 thru I.1.p.5). The Bay Plain, which constitutes only ten percent of the region's land area, contains seventy percent of the region's population and eighty percent of its economic activity. San Francisco, Oakland and San Jose are the region's principal centers of multi-functional urban activity. San Francisco is the region's dominant retail, trade, administrative, financial and distribution center. Twenty-six percent of the Bay Area's labor force is employed there. Although a majority of the labor force resides outside of San Francisco, residential densities within San Francisco are highest in the Region (see Figures 3-1, 3-4 and 3-5 for maps of the Bay Region).

Elsewhere in the Bay Plain exist linear bands of industrial activity along the waterfront and regional sub-centers, including San Mateo, Redwood City and Sunnyvale in the West Bay and Fremont, Hayward and Richmond in the East Bay. Most commercial development, outside of major concentration in San Francisco and Oakland and lesser concentrations in the CBD's of other cities, is located in strips along major transportation corridors or in clusters around shopping centers. Throughout the Plain, the high-density residential areas tend to be near major employment centers along the Bay shore while residential density decreases inland.

Suburban development in a number of sub-centers is characteristic of the rest of the Region. Bay Plain population has overflowed into southern Marin County, the Orinda-Walnut Creek-Concord area in Contra Costa County, the Livermore-Amador Valleys and up the Santa Clara Valley. These areas function mostly as bedroom communities to the employment centers of the Bay Plain.

A number of sub-centers, such as Novato, Vallejo and Antioch, have been created beyond the urban core by the location of steel, oil and chemical plants and military installations. Santa Rosa and Napa function as important sub-regional service centers whose markets and populations are largely independent of the region's central core. Throughout the region's outer areas the cities are usually small and self-contained with diversified economic bases reflecting the influences of geography and local resources. Residential density in these outlying areas tends to be much lower than those of the urban core.

Golden Gate and Marin-Sonoma Coast Corridors. Urbanization in Marin County has been confined primarily to the Bayside valleys and the flatlands adjoining the Bay shores in southern Marin. Hills running perpendicular to the north-south oriented Bolinas Ridge and Marin Mountains act as barriers to contiguous development of the plain lands. The pattern of urbanization is characterized by the existence of physically discrete communities.

A similar situation exists in Sonoma County where the Petaluma-Cotati-Santa Rosa and Sonoma Valleys contain the bulk of urbanization. Agriculture is a more predominant land use in Sonoma and northern Marin.

Most cities in these areas are separated by farm and pasture land as well as by topography.

Marin County depends considerably upon employment outside of its boundaries. In 1970, 47% of Marin's 80,620 resident labor force worked elsewhere than Marin (Reference 17, pages 1 and 2). Unlike Marin, only about 18% of Sonoma's labor force worked outside of the county in 1973 (Reference 16, page 20).

West and northern Marin and much of Sonoma County possess some of the region's most valuable open space, recreational and agricultural resources (Reference 12, page 36). The Marin coast is the site of a number of national and state recreational areas such as Point Reyes National Seashore, Muir Woods National Monument, Golden Gate National Recreation Area, Mt. Tamalpais State Park and Stinson Beach. The Sonoma Coast and Russian River areas are popular recreation sites in Sonoma County (see Section 3.7 for further discussion of natural resources). Both Marin and Sonoma Counties plan to preserve these natural portions of their environments (References 16 and 17).

3.5 Fiscal Characteristics*

3.5.1 Transit Revenue Sources

Federal. The National Mass Transportation Assistance Act established grant programs for public transportation assistance. Included are:

(1) Section 3, Capital Grants. These funds are allocated by the U.S. Department of Transportation on the basis of recommendations by MTC. The grants are available at amounts up to 80% of the total project cost. The remaining 20% must be locally financed. Section 3 funds are limited and must be re-enacted to provide for grants beyond 1980.

(2) Section 5, Optional Grants. These funds are distributed on a formula basis to each metropolitan area of which there are four in the nine-county Bay Area. Grants can be applied to either capital improvements (up to 80% of project cost) or operating costs (up to 50% of operating deficits).

(3) Sections 6 and 9. These sections include demonstration and technical study grants allocated locally through MTC.

The Federal Aid Highway Act of 1973 allows funds to be diverted at local discretion from highway capital improvements to transit capital improvements with both U.S. DOT and MTC approval.

Federal revenue-sharing funds distributed to cities and counties

*The content of this section was taken entirely from References 10, 11 and 12, listed at the back of this report.

on a formula basis can be used for transportation purposes at local discretion. Santa Rosa and San Francisco are the only cities to currently exercise this option.

State. A portion of taxes on motor vehicles and fuels are distributed to cities and counties for highway purposes. Certain state highway user revenues are discretionary, a percentage being available for public transit guideways contingent upon local voter approval.

The California Transportation Development Act of 1971 established a special fund from state sales tax revenues. One-quarter of one percent of county taxable sales is returned to each county for transit and other purposes. A limit of 85% is put on use for transit operating expenses.

Local. There are a number of local sources of transportation revenue, some currently used and some not.

(1) Bay Bridge Tolls. Under A.B. 664, MTC is conditionally empowered to set toll rates and allocate surplus revenues for the six Bay Area bridges operated by the California Toll Bridge Authority (see Section 3.7). To date, BARTD has been the only recipient of these monies (\$180 million to construct the transbay tube).

(2) Property Tax. Four counties in the Bay Area support transit from this source through both municipal general funds and special purpose districts: San Francisco, Alameda, Contra Costa and Marin. Such cities as Berkeley, Newark and Fremont have also supported transit through a property tax.

(3) Sales Tax. An emergency one-half percent sales tax currently supports BARTD in its three-county district: Alameda, Contra Costa and San Francisco. The recently created San Mateo Transit District has the ability to initiate a one-half percent sales tax for transit improvement and operation in San Mateo and Santa Clara Counties.

(4) Parking Charges. Municipal parking revenues go into a general purpose fund which then may be allocated to transportation purposes (highway). No direct transit support has ever been derived.

(5) Bonding. Various municipalities and special districts have borrowed money to finance transportation related projects in the past. The Golden Gate Bridge District went into bonded indebtedness to construct the Golden Gate Bridge. More recently, BART voters approved a bond to construct the BART system.

(6) Farebox Receipts. Fare increase can usually generate additional revenues.

There are various potential funding sources at the local and state levels that may, in the future, provide new revenue for transit.

(1) Benefit Assessment Districts. Similar to existing sewer, water, and mosquito abatement "benefit" districts, the purpose is to recoup part or all of the costs of public improvements to those areas which tend to benefit the most.

(2) Income Tax. There is presently no direct state income tax support for local general purpose governments or special districts, although state general fund reimbursements to local governments may, however, contribute indirectly to transit support. The Legislature and Governor retain sole authority to enact any changes to the state income tax program. California law prohibits the imposition of income tax by local governments.

(3) Excise Tax. Taxes on cigarettes and alcohol currently flow into general funds at both state and local levels. Neither source is used directly for transportation purposes at this time. There is a limited application of excise taxes on utility charges going toward transit support in San Francisco. The city's publicly-owned utility, Hetch Hetchy, contributes approximately \$4 million annually to San Francisco Municipal Railway.

3.5.2 Administration of Funds

MTC is the regional authority for transit and highway related financial planning, programming, project review and financial allocation. Under OMB Section A-95 review for transportation projects and California Statutes, MTC is responsible for the review and approval of only those projects using federal or state monies which conform to the Regional Transportation Plan. MTC also has policymaking responsibility to allocate funds for transportation development and operation under California's Transportation Development Act of 1971. California Statutes also define MTC's responsibility to set state operated toll bridge rates (see Section 3.7).

In response to Assembly Bill 3785, MTC has recently defined a plan for near and long-term financing of public transit in the Bay Region. Priority has been given to preserving existing or committed transit service with critical financial needs: BART, MUNI and AC Transit, in particular. These three systems are expected to require \$319 million through 1981. Golden Gate Bridge, Highway and Transportation District transit service is not included with this group since it is judged to be self-sufficient through 1980/81 by using revenues from Golden Gate Bridge tolls.

MTC is placing emphasis on the use of state, regional and local revenue sources to meet the financial needs of the region's transit systems beyond 1981. Among MTC's recommended actions to improve the financial state of transit in the region are: (1) selective fare increases, (2) regional funds for "corridor" type projects, (3) increased local taxes for local service, (4) a separate state transit fund program, (5) reduction of tax and toll burdens in transit, and (6) providing additional state support. In general, MTC has concluded that vehicle related taxes should be relied upon as the primary source of public support for transportation improvement.

Bridge tolls and special vehicle fees are top priority, followed by registration fees and fuel taxes. In addition, sales tax and income tax are recommended as broadbased tax revenue sources for transit support.

3.6 Rare or Unique Environmental Resources

The following subject areas are addressed in Sections 3.7.4, 3.7.6, 3.7.9 and 3.7.10 of the Initial Environmental Study of Proposed Toll and Fare Increases (which is attached to the back of this report).

- (1) Geology and Soils (3.7.4)
- (2) Topography (3.7.6)
- (3) Wildlife and Vegetation (3.7.8)
- (4) Visual, Aesthetic and Archeological Resources (3.7.9)
- (5) Mineral, Agricultural and Recreational Resources (3.7.10)

It was concluded in those sections of the Initial Study that the Proposed Action would have no significant effect on the respective subject areas.

3.7 Related Projects

Metropolitan Transportation Commission--Proposed Bridge Toll Schedule. MTC has proposed to adopt the toll schedule shown in Table 3-7 in lieu of the current toll schedule for the San Francisco-Oakland Bay Bridge, the San Mateo-Hayward Bridge and the Dumbarton Bridge, effective July 1, 1977, under the authority invested by the California Streets and Highway Code Section 30886.

MTC's objectives in proposing the new toll schedule are to create revenue to finance transit capital expenditures in the vicinity of the bridges and to achieve more efficient utilization of bridge traffic capacity.

An Initial Environmental Study (February 10, 1977) was prepared by DeLeuw Cather & Company, consultants to MTC, in order to provide a preliminary review of the environmental significance of the project. MTC prepared a Negative Declaration pursuant to the California Environmental Quality Act as amended based on the study (Reference 8, pages 1 thru 4).

Following a period of public review, the MTC Work Program Committee recommended a modification of the proposed toll schedule: a \$.75 toll for Class I vehicles rather than the proposed \$1.00 toll.

On May 25, 1977, the Commission approved the modified toll schedule proposal. If the proposal is subsequently approved by the California

TABLE 3-7

MTC PROPOSED TOLL SCHEDULE CHANGES FOR SAN FRANCISCO-OAKLAND,
SAN MATEO-HAYWARD AND DUMBARTON BRIDGES

VEHICLE CLASS	SAN FRANCISCO- OAKLAND BAY BRIDGE		SAN MATEO-HAYWARD DUMBARTON BRIDGES	
	Current Schedule:	Proposed Schedule:	Current Schedule:	Proposed Schedule:
<u>Class I Vehicles</u>				
Automobile, ambulance, hearse, housecar,* station wagon, taxi, Class I bus* (no change for motorcycle or tricar)	\$0.50	\$0.75	\$0.70	0.75
<u>Commuter Bus</u>				
Vehicles with not more than four axles which are used to transport more than 12 persons on a regularly scheduled route.*	0.10	0	0.10	0
<u>Commuter Buses</u>				
Class I Vehicles and 2-axle, 4-wheel trucks. Buses contain one-way tickets each good for a single passage at any time during the two consecutive months, or fractional part thereof, for which sold. Booked valid at all three bridges.	8.00 (20 tickets)	12.00 (20 tickets)	8.00 (20 tickets)	12.00 (20 tickets)
<u>Carpools</u>				
Three or more persons per vehicle, Monday thru Friday, inclusive.	6 a.m. - 6 p.m. FREE	6 a.m. - 6 p.m. FREE	6 a.m. - 6 p.m. FREE	6 a.m. - 6 p.m. FREE
<u>Trucks</u>				
2-axle, 4-wheel	0.50	1.00	0.50	1.00

*NOTE: For vehicles not listed above, tolls remain the same as those in effect July 1, 1976.

SOURCE: Reference 8, page 2. (modified according to subsequent developments)

Toll Bridge Authority, the modified toll schedule will go into effect on July 1, 1977.

3.8 Water Quality

The dominant bodies of water in the region are the Pacific Ocean and the San Francisco Bay. A number of rivers, streams and creeks empty into the Ocean and Bay. The Bay has an effect on the region's climate, wildlife and fish habitats, and recreation. Most of the water used for human consumption comes from reservoirs and from wells.

There are three state established regional agencies in the Bay Area that have direct control over the factors that influence water quality. The Bay Conservation and Development Commission (BCDC) has jurisdiction over the San Francisco Bay and its shoreline (100 feet inland). The Central and North Central Coastal Zone Commissions have jurisdiction over the Pacific Ocean and its shoreline area from the seaward limits of the state to 1,000 yards landward from the mean high tide line. The California Regional Water Quality Control Board (San Francisco Bay and North Coast Regions) are responsible for water quality control and water pollution prevention through the enforcement of state water quality laws and the establishment of discharge requirements (Reference 18).

It was concluded in Section 3.7.5 of the Initial Environmental Study of Proposed Toll and Fare Increases (which is attached to the back of this report) that the Proposed Action would have no significant effect on the flow or quality of surface waters, ground waters, natural or man-made drainage.

4.0 ASSESSMENT OF ENVIRONMENTAL EFFECTS*

This section of the report assesses the impact of proposed bridge toll and transit fare increases. Impact assessment in this section is focused on two toll/fare schedule alternatives designated by the District's Board of Directors for primary consideration. Four additional toll/fare alternatives have also been assessed and are cited briefly in this section, particularly where impacts could vary substantially. For clarity of presentation, extensive presentation of impacts for Alternatives Nos. 3, 4, 5 and 6 has been deferred to Section 6 entitled, "Alternatives to the Proposed Action".

In the case of bridge toll/transit fare increases, estimation of impact is complicated by the choice of an appropriate set of "baseline" conditions. Conventional impact assessment identifies a no-build situation, in which the status quo; i.e., no construction, is a plausible set of conditions. In the case of toll/fare regulation, however, the status quo may well be untenable; i.e., either additional revenue (tolls, fares) must be obtained to meet escalating costs of service obligations or services must be pared to meet revenue resources.

For purposes of this environmental impact report, a "baseline" has been chosen which assumes both continued present toll and fare structure and continuation of the present bridge maintenance and transit service programs. Despite the fact that this baseline does not appear realistic without revenue from outside the District, this set of baseline conditions can be more reliably dimensioned and easily envisioned than impact relative to a pared-back transit service scenario, for which specific characteristics are unknown.

4.1 Traffic and Transportation

4.1.1 Existing/Baseline Conditions

Table 4.1.1 identified existing (April 1977) and projected (1985) travel volumes in the Golden Gate Corridor with a breakdown by mode and time of day. This baseline projection assumes continuation of the present toll and fare schedule, recent trends of auto volume growth exclusive of major fuel price change or rationing, and transit growth unrestricted by seating capacity or major price change. The baseline, developed from March 1977 travel data and GGBHTD Auditor's Report estimates, provides a basis for comparison of alternatives. The baseline conditions should not be considered a realistic "do nothing" alternative, however, unless revenue sources outside toll and fare increases (e.g., property tax, sales tax, state subvention) can be obtained to meet rising transit operating and bridge maintenance costs without disrupting the baseline price scenario. All alternatives which involve some form of toll and fare increase will require a departure from baseline conditions.

Travel characteristics of particular concern for this environmental impact report are the highway volumes across the Golden Gate Bridge at particular times of the day and their relationship to highway capacity, transit volumes across the Bay by bus and ferry, and transit volumes across the Marin-Sonoma line. Overall personal travel across the Bay is expected

*This section of the report was developed by DeLew Cather & Company based upon data provided by GGBHTD staff at the direction of DeLew Cather.

TABLE 4-1

SUMMARY OF TRANSPORTATION IMPACTS RELATIVE TO "BASELINE"

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
1. Increases Cost, North Bay/San Francisco Trip (Round Trip)						
- Auto Driver	\$0.05 - \$0.25	\$ \$0.25	\$ \$0.25	\$0.15 - \$0.25	\$0.00 - \$0.75	\$ 0.25 - \$1.25
- Bus Rider, Marin County/San Francisco	0 - 1.00	0 - 1.00	.25 - 1.00	.25 - 1.00	0 - 1.00	0 - 1.00
- Bus Rider, Sonoma County/San Francisco	0.00 - 1.50	0.60 - 1.50	0.20 - 1.00	0.60 - 1.50	0.60 - 1.50	0.60 - 1.50
2. Increased Cost, Marin/Sonoma Transit (Round Trip)	0.50 - 1.50	0.50 - 1.50	0 - 1.00	0.50 - 1.50	0.50 - 1.50	0.50 - 1.50
3. Reduced Travel Delay at Toll Plaza (Comute Peak Southbound Only)	Minutes 1 - 2	Minutes 1 - 2	Minutes 1 - 2	Minutes 1 - 2	Minutes 1 - 2	Minutes 1 - 2
4. Change in Bridge Traffic Volume	Vehicles	Vehicles	Vehicles	Vehicles	Vehicles	Vehicles
- Commute Peak Increase (Decrease)	300 - 600	0 - 300	300 - 600	400 - 800	(1200 - 2400)	(2000 - 4000)
- Weekday Off-Peak Decrease	500 - 1000	500 - 1000	500 - 1000	500 - 1000	1500 - 3000	500 - 1000
- Weekend Day or Holiday Decrease	900 - 1800	900 - 1800	900 - 1800	900 - 1800	3000 - 6000	900 - 1800
5. Increased (Decreased) Travel Delay on U.S. 101 Due to Added Vehicles (Comute Peak Southbound Only)	Minutes 1 - 3	Minutes 0 - 1	Minutes 1 - 3	Minutes 2 - 4	Minutes (6 - 10)	Minutes (10)
6. Reduced Transbay Transit Ridership	Riders	Riders	Riders	Riders	Riders	Riders
- Commute Peak	350 - 700	200 - 400	400 - 800	500 - 1000	0	0
- Weekday Off-Peak	700 - 1000	700 - 1000	700 - 1000	700 - 1000	700 - 1000	700 - 1000
- Weekend Day or Holiday	700 - 1000	700 - 1000	700 - 1000	700 - 1000	700 - 1000	700 - 1000
7. Reduced Marin/Sonoma Transit Ridership (Daily)	Riders 70	Riders 70	Riders 70	Riders 70	Riders 70	Riders 70
8. Forgone Trips	Trips	Trips	Trips	Trips	Trips	Trips
- Commute Peak, Transbay	700 - 1000	0	0	0	0	0
- Weekday Off-Peak, Transbay	700 - 1000	700 - 1000	700 - 1000	700 - 1000	1400 - 2500	700 - 1000
- Weekend Day or Holiday, Transbay	70	70	70	70	1700 - 3000	700 - 1000
- Daily Marin/Sonoma					70	70

TABLE 4.1.1

TRAVEL VOLUME IN THE GOLDEN GATE CORRIDOR
1977 AND 1985: BASELINE CONDITIONS

<u>Characteristics</u>	<u>March 1977 (1)</u>	<u>1985 (2)</u>	<u>Annual Increase (2)</u>
<u>Person Trips, Transbay</u>			
Commute Peak (3)	39,600	48,200	1,000 2.6% Daily
Weekday Off-Peak (4)	49,100	59,900	1,400 2.5% Daily
Weekend Day/Holiday	196,800	241,000	5,500 2.8%
<u>Traffic Volumes, Transbay</u>			
Commute Peak	21,700	23,500	200 2.0% Daily
Weekday Off-Peak	31,800	37,300	700 1.2% (5)
Weekend Day/Holiday	90,800	107,600	2,100 2.5%
<u>Transit Ridership, Transbay</u>			
Commute Peak	10,800	16,900	800 5.5% Daily
Weekday Off-Peak	6,800	10,300	500
Weekend Day/Holiday	11,600	21,800	1,300
<u>Bus Ridership, Transbay</u>			
Commute Peak (6)	8,700	12,400	500 4.5% Daily
Weekday Off-Peak	4,500	6,400	200
Weekend Day/Holiday	4,200	6,000	200
<u>Ferry Ridership (7)</u>			
Commute Peak	2,100	4,500	300 10.0% Daily
Weekday Off-Peak	2,300	4,900	300
Weekend Day/Holiday	7,400	15,800	1,100
<u>Bus Ridership, Between Marin and Sonoma Counties</u>			
Commute Peak	100	150	6 5.5% Daily
Weekday Off-Peak	200	300	12
Weekend Day/Holiday	200	300	12

- (1) Golden Gate Bridge, Highway and Transportation District Commute Peak Counts, March 14, 1977. Off-peak and Weekend computed from Monthly Summary Report, March 1977 and Bus System Deficit Reports October-November 1976.
- (2) Obtained from GGBHTD Auditor's Report Projections extrapolated to 1985, except as noted.
- (3) Commute Peaks 6-10 a.m. southbound.
- (4) Weekday Off-Peak = daily minus 2x commute peak; includes off-peak direction during commute peak period.
- (5) Marin County Balanced Transportation Planning Program, 1985 Trip Table for Lower Ross Valley, Alternate B.
- (6) Includes approximately 500 club bus riders.
- (7) Includes Sausalito, Tiburon and Larkspur Ferry riders.

to increase at 2.6% per year, a rate approximately one-half that of a decade ago. Transit passenger growth (5.5% per year) is expected to outpace the auto growth rate (2.0% per year), principally due to expected greater use of transit in the commute peak. The commute peak vehicle volume is expected to increase at a very low rate (1.2% or about 200 added vehicles during the 6-10 a.m. morning commute), due in part to existing congestion which places an effective ceiling on commute peak volumes and in part to the GGBHTD's pursuit of high-occupancy vehicle alternatives, including development of quality commute bus service, new Larkspur ferry service, and toll-free carpooling between 6 and 10 a.m.

Table 4.1.2 indicates current choice of mode for the transbay trip during commute peak, weekday off-peak, and weekend/holiday periods. The commute peak includes southbound travel between 6 and 10 a.m. and northbound travel between approximately 3:30 p.m. and 7:30 p.m. Travel in the reverse direction during the commute hours is included with weekday off-peak travel, along with early morning, midday, evening and nighttime travel. Choice of mode, vehicle occupancy and trip purpose is relatively similar for these various off-peak travel periods. Saturday, Sunday and holiday travel is also a fairly homogeneous travel grouping.

Note that commute peak travel is currently 27.3% by transit and 11.9% by carpool (3 or more occupants per vehicle) for a total of almost 40% of travel by high-occupancy vehicles. The District Board has adopted a policy of carrying 50% of the commuters between 7 and 8 a.m. by transit in 1980. The District estimates 40% of current peak one-hour travel is using transit and, if carpools are included with transit, the 7 to 8 a.m. percentage is already 50%.

During off-peak hours, percentage of trips by transit drops substantially, reflecting a decline in the portion of routine trip making (work, school), more dispersed trip destination to locations with lower parking costs, and lower level of transit service available.

Although auto use is the predominant travel mode transbay on weekends and holidays, auto occupancy on these days (2.04) is considerably higher than during the weekday (1.33 for peak and off-peak).

Table 4.1-3 indicates the distribution of auto registrations for commute peak auto users, while Figure 4.1-1 illustrates the distribution of trip origins for transit commuters. Transbay travel during weekdays is dominated by Marin County to San Francisco travel, especially the south and central Marin County to downtown San Francisco movement. Sonoma County accounts for less than 10% of auto and transit travel transbay, but is increasing at a rapid rate.

The auto catchment area is somewhat larger than the transit catchment. The typical (median length) auto commuter originates in northern San Rafael and is bound to northeast San Francisco, a 24-mile trip. The typical transbay bus user originates in central San Rafael and is destined to downtown San Francisco, a 20-mile trip. The typical ferry user originates in the central Ross Valley area destined to the

TABLE 4.1.2

MODE CHOICE OF GOLDEN GATE TRANSBAY TRAVELERS,
GOLDEN GATE CORRIDOR, 1977
 (Percent of Total Person Trips)

<u>Mode</u>	<u>Commute Peak (2)</u>	<u>Weekday Off-Peak (3)</u>	<u>Weekend Day/ Holiday (3)</u>
Auto			
1 occupant	40.3	48.8	16.6
2 occupants	20.5	24.8	38.0
3+ occupants	11.9	14.5	39.5
Bus	22.0 (1)	9.2	2.1
Ferry	<u>5.3</u>	<u>4.7</u>	<u>3.8</u>
Total	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>

(1) Includes approximately 500 club bus riders.

(2) 6-10 a.m. southbound; obtained from GGBHTD General Manager's Report, March 25, 1977; data for March 14.

(3) Computed from GGBHTD Monthly Summary Report for March 1977, Bus System Deficit Reports, October-November 1976 and March 25, 1977 General Manager's Report

San Francisco Financial District, a 23-mile trip, including feeder bus or auto access to the Larkspur Terminal.

Figure 4.1-2 illustrates the comparative cost and travel time required for each mode of travel in the commute peak and in the off-peak. The comparison is for a round trip from selected Marin and Sonoma County locations to downtown San Francisco. Travel costs have been equated to time (impedance) using a factor of 15 minutes for \$1.00 in the commute peak and 30 minutes per \$1.00 in the off-peak. This assumes a person values his commute time at approximately 40% of his hourly wage of \$10 per hour and that the value of time to the typical off-peak traveler is roughly one-half the commute peak value. Walk and wait time have also weighted (1.75 and 2.50, respectively) to reflect greater perceived impedance than travel time itself.

The net travel impedance of each mode increases with length of the trip. Carpool travel is most competitive with the automobile, bus next most competitive, and ferry least competitive. The carpool has a substantial edge over the bus for Marin/San Francisco trips, while this is not the case for Sonoma/San Francisco trips.

Note that the auto has a time advantage over transit modes, while high occupancy vehicles have a cost advantage over the single-occupant car. Thus, those who value time savings most are inclined to drive, while those who value dollar savings will be most likely to carpool or take the bus. Since the bus competitive position derives from its cost savings, vis-a-vis, increased travel costs are most likely to affect bus ridership. The auto's competitive position derives from its time advantage and increased congestion and delay are most likely to affect the portion of people who drive alone.

The value of the proposed toll/fare increase (Alternatives 1 and 2 without discount) is indicated at the top of each bar in Figure 4.1-2. Note that the increase is greatest for the bus mode and that this increases with trip length.

Figure 4.1-3 compares traffic volume and capacity across the Golden Gate Bridge in the commute peak. Comparison is made for each quarter-hour period between 6 a.m. and 10 a.m. for southbound traffic. At present, the traffic volume reaches capacity for a 1-hour and 30-minute period between 7:15 a.m. and 8:45 a.m. Based upon the projected increase in commute peak traffic volume (Table 4.1-1), southbound traffic could be expected to maintain the 6800 vehicle per hour capacity level for two hours duration.

Attainment of capacity signals traffic congestions and travel delay. Figure 4.1-4 indicates amount of travel time, including delay for a driver entering U.S. 101 southbound at Freitas Parkway (Terra Linda). The majority of the maximum 10-minute delay occurs in the Tiburon Wye/Seminary Drive area, and between the Waldo Tunnel and the Toll Plaza. The evening delay northbound is almost twice as long since local traffic in central Marin County is superimposed on transbay volumes. Experience in the East Bay where the duration of traffic delay has reached levels comparable

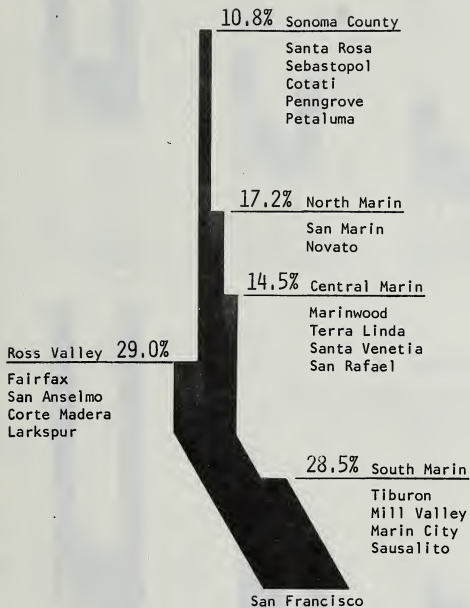


Figure 4.1-1
ORIGIN/DESTINATION SURVEY
GOLDEN GATE TRANSIT COMMUTERS

Source: Golden Gate Corridor Transportation Facilities Plan,
Report to California State Legislature, September 1975

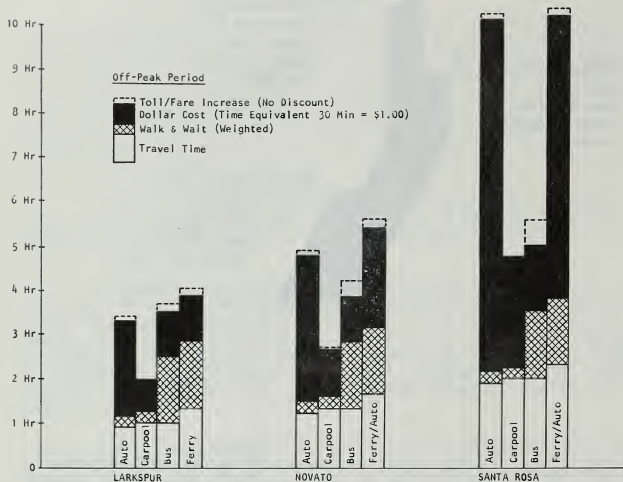
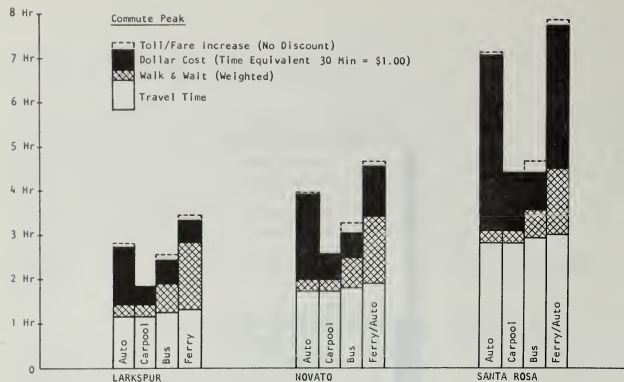


FIGURE 4.1-2
IMPEDANCE FOR ROUND TRIP BETWEEN NORTH BAY
AND DOWNTOWN SAN FRANCISCO

TABLE 4.1-3

DISTRIBUTION OF AUTO REGISTRATION FOR GOLDEN GATE BRIDGE USERS

	<u>Marin</u>	<u>S.F.</u>	<u>San Mateo</u>	<u>Sonoma</u>	<u>Other Calif.</u>	<u>Out of State</u>	<u>Total</u>
<u>Commute 6-10 A.M.</u>							
March 1977	64.1	11.4	2.7	9.3	9.9	2.6	100%
February 1977	64.6	12.4	3.2	8.0	7.5	4.3	100%
October 1975	65.0	10.9	4.0	6.9	9.1	4.1	100%
<u>Weekday</u>							
March 1977	48.4	16.9	7.1	8.5	14.6	4.5	100%
February 1977	50.2	17.7	6.5	7.8	12.0	5.8	100%
October 1975	46.5	16.9	7.8	7.4	15.0	6.4	100%
<u>Saturday, March 26</u>							
March 1977	32.6	21.7	11.9	8.7	21.6	3.5	100%
February 1977	34.5	20.9	10.3	8.9	18.5	6.9	100%
October 1975	29.9	23.9	9.9	7.9	20.7	7.9	100%
<u>Sunday, March 27</u>							
March 1977	21.6	29.8	16.5	6.0	21.6	4.5	100%
February 1977	25.4	29.1	13.3	5.5	21.1	5.6	100%
October 1975	24.6	26.1	14.3	4.5	22.2	8.3	100%
<u>Overall</u>							
March 1977	42.6	19.3	9.0	8.2	16.5	4.4	100%
February 1977	47.0	18.9	7.3	7.7	13.2	5.9	100%
October 1975	41.6	19.0	8.8	7.1	16.7	6.8	100%

Weekday range for the 5 days in March	47.7- 48.7	16.2- 17.9	6.2- 7.9	7.8- 9.1	12.3- 15.8	2.9- 6.2
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SOURCE: GGBHTD Results of March 1977 License Plate Survey

with that portrayed by the 1985 projection in Figure 4.1-3 provides an indication of the amount of delay one could expect in 1985. Delay by 1985 could potentially double to 18-20 minutes southbound in the a.m. peak and longer northbound in the p.m. peak.

By comparing the projected 1977-85 commute traffic volume increase with the potential additional delay, one observes that each 200 vehicles added in the a.m. commute peak could mean one minute delay. Greater vehicle occupancy (carpooling), transit use, and staggering of work hours would reduce this delay.

4.1.2 Modeling Travel Impacts

The principal tool available for estimating travel impact of alternative toll and fare schedules is the GGBHTD Pricing Model, developed for the District in 1973 and used by McDonald & Greffe, Inc., to project revenue for the District. A by-product of the revenue estimation process is the estimation of travelers diverted from auto to transit and vice versa for the commute peak, weekday off-peak, weekend day/holiday and calendar quarter. The strength of this model is its ability to simulate the choice which people will make between auto and transit based upon relative cost and travel time of the auto, bus and ferry mode.

Unfortunately, no model can account for all factors involved in estimating travel behavior. The model does not account for several key variables: (1) no trips are assumed to be foregone as a result of toll/fare increase; and (2) shifts from 1-occupant and 2-occupant vehicles to carpooling and vice versa are not considered.

In reviewing the results of the GGBHTD Pricing Model in light of actual experience in the Golden Gate Corridor and travel behavior elsewhere, DeLeuw Cather believes the distinction among alternatives in terms of relative diversion from transit to auto is probably correct, but magnitude of diversion is open to question. Likewise, the estimates of vehicle volumes and transit patronage appear correct as aggregate daily or annual figures, but disaggregation of bus and ferry or between peak and off-peak projections must be carefully checked for reasonableness. Conclusions which could be drawn from commute peak results appear fairly indicative, if cautiously interpreted, while off-peak mode results appeared counter-intuitive, due to constraint (1) outlined above. Implications regarding off-peak travel impact were believed best drawn from experience.

4.1.3 Travel Impacts

Table 4.1-4 indicates the impact of alternative toll/fare schedules on transbay travel mode choice, as derived from the GGBHTD Pricing Model. The percentage of total person trips diverted from transit to auto is shown for commute peak, weekday off-peak, and weekend/holiday travel.

Peak Volume at Tollgate ~6800/Hr

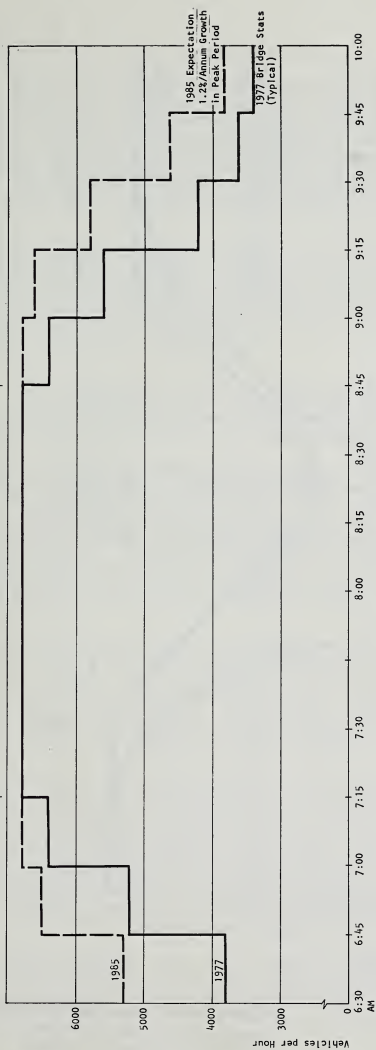
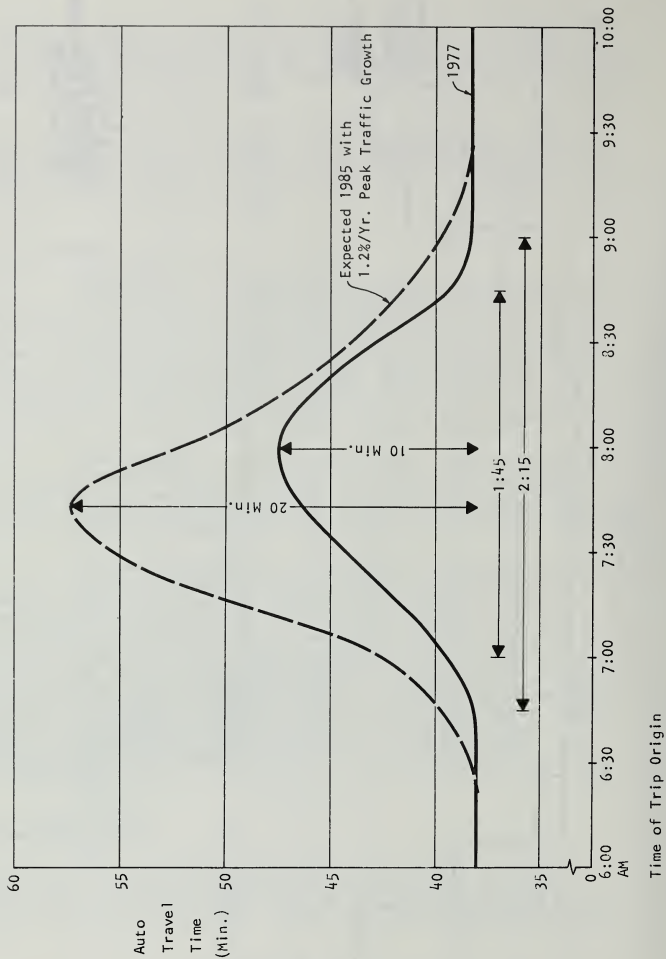


FIGURE 4.1-3
GOLDEN GATE BRIDGE
SOUTHBOUND AM TRAFFIC VOLUME
1977 & 1985 BASELINE



Source: 1977 CALTRANS, 1985 Estimate

Based on Figure 4.1-3 and East Bay Experience

Figure 4.1-4
TRAFFIC DELAY FOR MORNING COMMUTE
(Southbound to San Francisco Financial District
from Freitas Parkway On-Ramp)

The table shows a potential diversion from transit to auto mode for both Alternatives 1 and 2. Alternative 1 would have greater impact, since discounting auto toll increases transit cost relative to automobile cost. For Alternative 1 during the commute peak, the 1.0% diversion translates to approximately 700 to 800 transit patrons who would leave the bus to occupy 500 to 600 additional vehicles between 6 and 10 a.m. each morning. Alternative 2 diversion of 0.6% translates to approximately 400 to 500 fewer transit patrons and 300 to 400 more vehicles in the a.m. peak.

Independent estimates of mode choice using mode choice diversion curves from the Bay Area Transportation Study (BATS, 1969) and MTC Bridge Toll Initial Environmental Study (1977), which included analysis of the impact of fuel price increases on transbay traffic in 1973/74, indicated commute peak diversion may be substantially less than the above estimates, perhaps only one-half the model estimate.

Few, if any, trips would be foregone in the commute peak, since 95% of the commute peak trips are estimated to be work, business or school trips, not easily forgone (based on Bay Bridge survey of auto, bus and BART users for the BART Impact Program, 1976).

By retaining the practice of allowing carpools to pass through the toll gate without charge, the difference between regular auto toll and toll free carpooling would be widened. This would encourage carpooling slightly and tend to dampen increased traffic volumes. In other words, many of those persons who leave transit may end up in carpools rather than driving by themselves. This was the experience during the 1976 Golden Gate Transit strike when the 27% of commuters who normally take transit were largely absorbed by carpooling with average occupancy increased to 1.50 persons per vehicle.

The characteristics of trip purposes and traveler income during off-peak hours make midday, nighttime and weekend travelers more sensitive (perhaps by a factor of 2 to 3) to toll/fare increases and subsequently more likely to shift from transit to auto mode or forego the trip altogether. At the same time, however, most of those diverted from transit will probably be foregone, rather than diverted to auto since many who use transit in the off-peak do not have an auto available to them.

Review of travel model results for all alternatives indicates transit fare increases of the magnitude proposed have far more impact on travel behavior (perhaps by a factor of 4 to 5 times) than toll increases contained in Alternatives 1 thru 4. Alternatives 1 thru 4 will all divert persons from transit to auto modes with the impact of Alternatives 3 and 4 being roughly twice the impact of Alternatives 2 and 1, respectively. Increased toll for single-occupant vehicles (Alternatives 5 and 6), on the other hand, would have approximately an equally depressant effect on both auto driving and transit ridership (see Chapter 6).

Traffic Volumes. Table 4.1-5 indicates GGBHTD model projections for the number of vehicles added to the Golden Gate Bridge as a result of toll/fare pricing Alternatives 1 and 2. The average commute peak (6 to 10 a.m. southbound) volume is shown for comparison with the hypothetical baseline

TABLE 4.1-4

IMPACT OF ALTERNATIVE TOLL/FARE SCHEDULES
ON TRANSBAY TRAVEL MODE CHOICE

(Percentage of Total Person Trips Across Golden Gate)

	<u>Alternative 1</u>	<u>Alternative 2</u>
	\$1.00 Auto/20% Discount	\$1.00 Auto/No Discount
	\$2.25 Maximum Transit	\$2.25 Maximum Transit
	<u>20% Discount</u>	<u>\$20% Discount</u>
<u>Commute Peak</u>		
<u>(Peak Direction)</u>		
Auto	+1.0	+ .6
Bus/Ferry	-1.0	- .6
Foregone	0	0
<u>Weekday, Off-Peak</u>		
<u>(Including Off-Peak Direction)</u>		
Auto	+1.1	+1.0
Bus/Ferry	-1.1	-1.0
Foregone	0	0
<u>Weekend Day or Holiday</u>		
Auto	0	0
Bus/Ferry	0	0
Foregone	0	0

SOURCE: Impact on mode choice from GGBHTD Pricing Model
 Formulation and Calibration by McDonald & Grefe, Inc.,
 March, 1977.

See Table 3, Appendix B, for commute peak.

TABLE 4.1-5

IMPACT OF ALTERNATIVE TOLL/FARE SCHEDULES ON TRAFFIC VOLUMES
ACROSS THE GOLDEN GATE BRIDGE

(A.M. Peak, 6-10 A.M., Southbound; Volume in Thousands)

	<u>1977/78</u>	<u>1978/79</u>	<u>1979/80</u>	<u>1981/82</u>	<u>1982/85</u>
Baseline	21.4	21.9	22.3	22.8	23.3
Alternative 1 (Change from Baseline)	21.7 (+.3)	22.2 (+.3)	22.7 (+.4)	23.2 (+.4)	23.6 (+.3)
Alternative 2 (Change from Baseline)	21.6 (+.2)	22.0 (+.1)	22.5 (+.2)	23.0 (+.2)	23.5 (+.2)

SOURCE: GGBHTD Pricing Model Formulation and Calibration,
 McDonald & Greffe, Inc., March 1977.
 (See Table 3, Appendix B)

situation. Alternative 1 would increase traffic volumes by 300 to 400 vehicles in the peak period, roughly twice the impact of Alternative 2.

These estimates assume average vehicle occupancy will not be affected by the increasing disparity between regular auto fare and toll-free carpooling. From a practical standpoint, however, the increased average auto occupancy in the commute peak, thus lowering the total number of autos on the bridge. Although we do not have a precise understanding of the chain of events leading to increased average auto occupancy, several factors are apparent: (1) increased carpooling is attributable to diversion from regular auto and transit modes; and (2) the amount of diversion is increased by lowering toll and travel time for the carpool relative to other travel modes. Intuition indicates regular auto users are more likely persuaded by travel time advantage, while transit users are more likely persuaded by cost advantage.

The importance of auto occupancy in determining traffic impacts can be demonstrated easily. For example, if peak period vehicle occupancy can be increased from 1.33 to 1.35, traffic volume could be reduced 4%, more than sufficient to offset the projected traffic increase from either alternative toll/fare scenario.

Although Alternative 1 offers little incentive for increased auto occupancy (i.e., difference between discounted auto toll and free carpool increase of \$0.05), Alternative 2 could conceivably contain sufficient carpooling incentive to avoid a traffic volume increase.

Off-peak traffic volumes would almost certainly decline as a result of either Alternative 1 or Alternative 2 toll/fare schedules. Auto users faced with a toll increase are not likely to turn to transit as an alternative, since transit fares will be increasing as much or more than auto toll. Also, the level of transit service available in the weekday off-peak and weekend/holiday periods does not provide an attractive alternative to those diverted from the auto due to increased tolls/fares. The auto user may forego his trip as a consequence.

At the same time, off-peak transit patrons are frequently transit-dependent; i.e., they do not have an auto available to them. Hence, when diverted from transit, the trip will be foregone rather than diverted to auto mode.

The net effect may be a low percent decline in off-peak person trips under both toll/fare Alternatives 1 and 2. For the weekday off-peak this translates to a 500 to 1,000 vehicle reduction. For the weekend day/holiday this equates to a 900 to 1,800 vehicle reduction. No difference between Alternatives 1 and 2 would be expected in the off-peak, since most drivers are not expected to use discount books and those that can afford the investment in ticket books in advance of need would probably not be dissuaded from driving due to price increases anyway.

Review of toll/fare Alternatives 3 thru 6 indicates Alternatives 3 and 4 would increase auto volumes in the commute peak and decrease volumes in the off-peak, in much the same manner as for Alternatives 1 and 2. Alternatives 5 and 6, on the other hand, would reduce traffic volumes

in the peak as well as the off-peak by imposing premium fare on 1-occupant vehicles to encourage carpooling (see Chapter 6).

Traffic Congestion. Boosting of auto toll to \$1.00, with or without use of commute books, is expected to expedite flow of vehicular traffic through the toll gate to the Golden Gate Bridge. A current maximum 1 to 2-minute delay southbound in the a.m. commute peak should be eliminated as the current predominant transaction--a dollar bill with a quarter change--is replaced by a single dollar bill transaction. This time savings would constitute a 1 to 2% reduction in round trip travel time for the typical commuter.

Use of commute books, facilitated by the 20% toll discount in Alternative 1, may expedite toll taking. However, wide use of commute books in Alternative 1 should not result in any significant traffic flow benefit over Alternative 2.

Review of the Golden Gate Bridge and U.S. 101 capacity and delay (see existing/baseline conditions) indicates that the typical commuter can expect a maximum 1 minute added delay for each 200 vehicles added to the a.m. peak period (6 to 10 a.m. southbound). Based on this premise, the added vehicle traffic generated by the Alternative 1 toll/fare package would cause the typical commuter up to three minutes added delay inbound in the morning or 6 minutes added delay for the round trip. This added delay constitutes approximately 3% to 6% increase in actual travel time.

Transit Patronage. A principal impact of both Alternative 1 and Alternative 2 will be to raise revenue to maintain and expand transit patronage in the Golden Gate Corridor. All of the revenue received from transit fare increases and a portion of the revenue received from toll increases would be used to finance bus and ferry operations.

Table 4.1-6 compares transit patronage for Alternatives 1 and 2 with the hypothetical baseline situation. The table was derived from the GGBHTD Pricing Model and subsequent adjustment to reflect current bus and ferry patronage levels. These data are consistent with Tables 4.1-4 and 4.1-5.

Table 4.1-6 indicates Alternative 1 would reduce a.m. peak period transit patronage by approximately 600 to 700 riders or 6% below baseline transit use. Alternative 2 with less incentive for auto use would divert approximately 300 to 400 riders, 3% below baseline ridership. Table 4.1-6 transit reductions may be considered an outside or maximum estimate of transit impact; actual reduction in the peak period may be below the level shown in the table, perhaps only one-half the diversion projected (see discussion at the beginning of Section 4.1.3).

Review of GGBHTD Pricing Model assumptions for reasonableness, especially compared with Bay Area Transportation Study (BATS) experience and Bay Bridge toll increase impact assessment (MTC Initial Environmental Study for Bay Bridges Toll Increase), indicates that almost all diversion is expected to be from bus to auto, since peak period ferry use appears fully insensitive to higher fares. Most ferry users in the commute peak

appear to have chosen the ferry mode over bus or auto despite time advantages of bus and auto modes. The appeal of ferry travel--quality of ride, life style, etc.--appears unlikely to be dimmed by slightly higher ferry fares, since the median family income of peak period ferry users is over \$25,000 annually.

Based on the above, up to a 7% drop in peak period bus use could be expected from Alternative 1 toll/fare structure. This drop would equal approximately 1.5 year's bus patronage growth at the 4.5% per annum projected by the GGBHTD Auditor's Report. Alternative 2 would equal approximately 10 month's bus patronage growth. This short-term reduction in patronage could temporarily reduce the number of standees and necessity to wait for the next bus or justify temporary reduction in the number of commute bus runs.

Off-peak diversion from transit (midday, evening, weekends, holidays) could be expected to be more than peak period diversion. Average income level of transit patrons is lower in off-peak hours, meaning the transit patron is more sensitive to higher fares. A corollary is that off-peak riders are more often traveling for non-work or non-school purposes (recreation, social, shopping, etc.) which are more easily postponed or foregone.

A general relationship observed in estimating diversion from transit to alternate modes is that diversion is inversely proportional to income of transit users; that is, as personal income increases, fare increases are less likely to cause change in travel behavior. A person earning \$10,000 a year, for example, would be expected to be twice as likely to be influenced by a transit fare increase as a person earning \$20,000.

Shifting the fare zone boundary to include the Tiburon Peninsula and Belvedere within Zone 3 rather than Zone 2 would have the net effect of boosting fares between this jurisdiction and San Francisco by 60% signaling a potential off-peak patronage decrease of about 20%. Since income is relatively high in the affected area, it is unlikely that this fare zone shift would reduce transit patronage from the area by more than 10%.

The net effect of Alternatives 1 and 2 fare schedules would be about 10% to 12% reduction in off-peak transit ridership or approximately 700 to 1,000 fewer riders in each weekday off-peak period and on each weekend day or holiday.

Intracounty transit travel would not be affected by the proposed fare schedule.

Review of toll/fare Alternatives 3 thru 6 indicates Alternatives 3 thru 6 would reduce transit ridership in much the same manner as Alternatives 1 and 2. Alternative 4 would reduce commuter transit patronage the most due to the widest difference between discounted auto and transit fares, while Alternatives 2, 5 and 6 would reduce commute peak patronage the least. All alternatives would have approximately the same effect in the off-peak, except for Alternative 3, which would reduce ridership between

TABLE 4.1-6

IMPACT OF ALTERNATIVE TOLL/FARE SCHEDULES ON TRANSIT PATRONAGE
(Commute Peak Period Patronage: 6 to 10 a.m. Southbound)

	<u>1977/78</u>	<u>1978/79</u>	<u>1979/80</u>	<u>1980/81</u>	<u>1981/82</u>
<u>Transbay Bus</u>					
Baseline	9,900	10,100	10,400	10,600	10,800
Alternative 1	9,300	9,400	9,700	9,900	10,100
(Change from Baseline)	(-600)	(-700)	(-700)	(-700)	(-700)
Alternative 2	9,500	9,800	10,000	10,300	10,500
(Change from Baseline)	(-400)	(-300)	(-400)	(-300)	(-300)
<u>Ferry</u>					
Baseline	1,800	1,900	1,900	1,900	2,000
Alternative 1	1,800	1,900	1,900	1,900	2,000
(Change from Baseline)	(0)	(0)	(0)	(0)	(0)
Alternative 2	1,800	1,900	1,900	1,900	2,000
(Change from Baseline)	(0)	(0)	(0)	(0)	(0)
<u>Total Transbay</u>					
Baseline	11,700	12,000	12,300	12,500	12,800
Alternative 1	11,100	11,300	11,600	11,800	12,100
(Change from Baseline)	(-600)	(-700)	(-700)	(-700)	(-700)
Alternative 2	11,300	11,700	11,900	12,200	12,500
(Change from Baseline)	(-400)	(-300)	(-400)	(-300)	(-300)

SOURCE: GGBHTD Pricing Model Formulation and Calibration,
 McDonald & Grefe, Inc., March 1977.

TABLE 4.1-7

FAMILY INCOME OF FERRY AND TRANSBAY BUS RIDERS FOR PEAK AND OFF-PEAK PERIODS
 (February 6 and 17 Surveys)

Annual Household Income	Larkspur Ferry Commute Periods (1977)		Larkspur Ferry Midday and Weekend (1977)*		Marin/SF Commute Bus Service (1975)		Marin/SF Basic Bus Service (1975)	
	#	%	#	%	#	%	#	%
Less than \$4,000	6	1.1	51	6.9	3	2.8	106	27.
\$4,000 to \$9,999	39	7.3	85	11.5	14	12.0	84	22.
\$10,000 to \$11,999	40	7.5	64	8.7	5	4.6	36	9.
\$12,000 to \$14,999	41	7.7	91	12.4	13	11.1	45	11.
\$15,000 to \$24,999	129	24.3	191	26.0	35	30.6	68	17.
\$25,000 or more	<u>277</u>	<u>52.1</u>	<u>254</u>	<u>34.5</u>	<u>44</u>	<u>38.9</u>	<u>43</u>	<u>11.</u>
Total	<u>532</u>	<u>100.0</u>	<u>736</u>	<u>100.0</u>	<u>114</u>	<u>100.0</u>	<u>382</u>	<u>100.</u>

*Midday and Weekend were combined because there was no significant difference in responses to this question.

SOURCE: GGBHTD Ferry User Survey March 1977 and Bus User Survey December 1975.

Sonoma and San Francisco less than other alternatives.

Foregone Travel. During the commute peak period, no reduction in total trip making would be expected, since virtually all trips are necessary for work, business, and school purposes. However, during weekday off-peak and weekend/holiday periods, some reduction in total travel will be expected since social, recreational and other non-essential trips may be foregone with higher toll and fare.

The majority of those diverted from transit in the off-peak would not be diverted to an alternate mode. Rather, they would forego the trip, either accomplishing the purpose of the trip at another destination (e.g., walk or transit trip close to home), deferring travel until several purposes can be accomplished at once, or forgetting about the trip altogether. A concurrent auto toll increase would make it less likely that a transit trip would be diverted to the automobile.

Meanwhile, few auto travelers would be encouraged to take transit, since transit fares rise more than auto tolls. Therefore, reduction in auto vehicle trips might be due to increased vehicle occupancy (shared ride) or foregone travel. Experience during the 1973-74 oil embargo indicates auto trips were not foregone until the supply of fuel was limited, and that increased cost of the trip (fuel price increase) did not reduce travel demand. It appears likely, therefore, that traffic volume reductions will be mostly attributable to increased vehicle occupancy.

Review of toll/fare Alternatives 3 thru 6 indicates these alternatives would have approximately the same effect as Alternatives 1 and 2. Alternative 3 would be less likely to cause foregone trips between Sonoma County and San Francisco but the off-peak Sonoma/San Francisco volume is a relatively small share of transbay transit travel.

4.1.4 Mitigation of Potential Adverse Transportation Impacts

Toll/fare Alternatives 1 and 2 would result in a net shift in passengers from transit to automobile, net increase in auto volume and slight traffic delay during the commute peak, and foregone trips by current bus users during the off-peak. To avoid such effects, the following measures may be considered:

(1) An option which increased roundtrip auto and transit costs equally would avoid shifting transit passengers into autos. Alternatives 2, 6 and 7 approach this objective for commute peak travel.

(2) An alternative auto toll structure could offer some toll discount to 2-occupant vehicles in peak periods and/or pricing penalty for 1-occupant vehicles (see Alternatives 6 and 7 in Chapter 6).

(3) Off-peak transit fares might be held at their present level to avoid substantial transit ridership decline in the off-peak.

(4) As an increased incentive for carpooling and transit use, extend high-occupancy vehicle lanes north of their present terminus near

Corte Madera Creek to bypass U.S. 101 congestion through San Rafael. This could offer buses and carpools several minutes time advantage in the morning and up to 10 minutes time advantage in the evening compared with travel time for 1-occupant and 2-occupant autos. A 10-minute time savings would be roughly equivalent to reducing carpool or transit ride cost by \$.50 to \$1.00.

(5) To shorten evening travel delay through San Rafael, Irwin Street on-ramps to northbound U.S. 101 could be metered during the evening peak. This could reduce travel time 7 to 10 minutes for both auto and transit, regardless of vehicle occupancy. Pursuit of ramp metering to avoid traffic delay will nullify opportunity to provide a travel time advantage for high-occupancy vehicles (see (4) above) and indirectly encourage longer trips. Ramp metering gives longer through trips on freeway priority while shorter trips are encouraged to use the local street system.

(6) To offer buses and carpools a time advantage, auto travel could be constrained through locations where bus and carpool lanes already exist, allowing high-occupancy vehicles to bypass congestion, rather than in mixed traffic downstream.

4.2 Socioeconomic Considerations

4.2.1 Existing Conditions: Regional Population Characteristics

Approximately one-fourth of the nine-county Bay Area's 1970 population of 4,628,000 lives within the principal catchment area of the Golden Gate Bridge and transit services; San Francisco, Marin and Sonoma Counties. San Francisco has by far the highest residential density with over 15,000 persons per square mile. Marin and Sonoma are among the four counties with the lowest population density in the Bay Area with 400 persons per square mile and 130 persons per square mile, respectively.

Table 4.2-1 indicates the portion of the population in low income, elderly, and racial minority groups for each of the bridge catchment area counties and the nine-county-region. Marin County had the highest median income (\$13,900) in the region in 1969, while Sonoma County had the lowest (\$9,700). Low-income households were largely concentrated in central core cities and minority communities (Figure 4.2-1), including central and southeast San Francisco, particularly in the Bayshore-south of Market districts, and Marin City. Sonoma County had the region's highest poverty rate (10.4% of families). Unemployment rates in 1970 were also above the regional average in Sonoma and San Francisco Counties.

The three most significant minorities in the region are Spanish, Black and Asian populations. The Census showed minority population highly concentrated, most significantly in Santa Clara, San Francisco and Alameda Counties. There minority populations are greatly under-represented in Marin and Sonoma Counties (see Table 4.2-1).

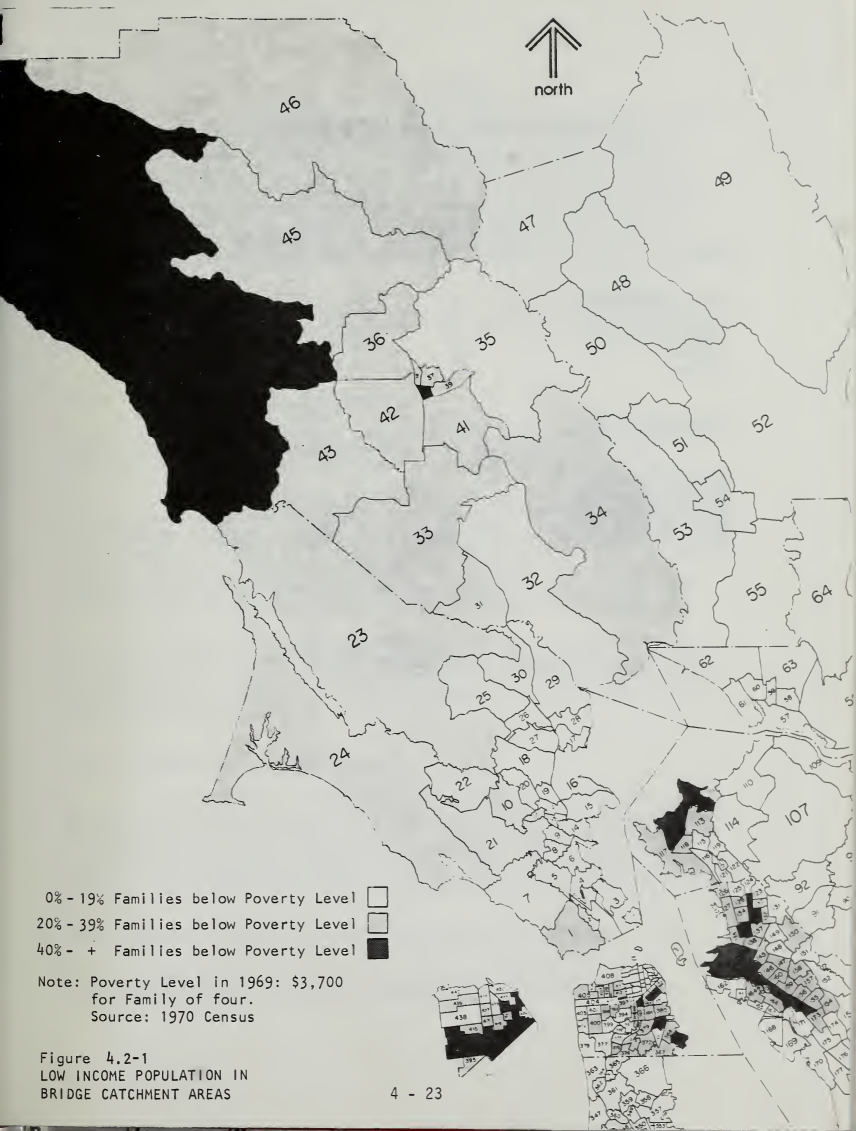


TABLE 4.2-1

DISTRIBUTION OF POOR, ELDERLY AND MINORITIES

<u>Group</u>	<u>SF Bay Area 9-County Region</u>	<u>San Francisco</u>	<u>Marin</u>	<u>Sonoma</u>
<u>Racial Minorities</u>				
Spanish-Surname	13%	14%	6%	7%
Black	8%	13%	2%	1%
Asian	5%	13%	1%	1%
<u>Persons 65 & Older</u>	8.9%	13.9%	8.7%	12.9%
<u>Percent of Households with Incomes Below Poverty Level (\$3,700 for a non-farm family of 4)</u>				
	9.4%	14.6%	9.2%	15.8%

SOURCE: 1970 Census of Population

Two age groups, the young and the elderly, constitute significant social groupings from the standpoint of transportation needs. The young (under 16) are unable to drive and must rely on other travel options. The elderly may have physical or financial handicaps which limit ability to drive. Significant numbers of young people were concentrated in areas outside the central cities, particularly parts of the east and south Bay areas. About half of the region's total elderly persons were found in San Francisco and Alameda Counties. A relatively high proportion (12.9%) of Sonoma County's residents were reported to be 65 years of age and over.

The distribution of non-auto units was highly concentrated in San Francisco, with 47.5% of the region's total. Marin County exceeded the regional average auto ownership with 1.5 or more cars per unit (compared to San Francisco's average of .78).

4.2.2 Regional Employment and Commerce

The catchment area of the Golden Gate Bridge contains approximately 35% of the Bay Area's employment. The majority of this bridge catchment area employment is located in downtown San Francisco.

Regionally, San Francisco's downtown contains the largest single concentration of employment with an estimated 186,000 office workers in 1974.* According to a report prepared for SPUR, San Francisco CBD office workers increased by 71,000 in the period from 1960 to 1974. San Francisco office buildings provide income for suburban commuters and an important tax base for the City. According to the 1970 U.S. Census, 38% of Marin County's employed residents worked in downtown San Francisco.

Prior to 1972, San Francisco captured an increasing percentage of regional commercial development as reflected by building permit valuation. In recent years, however, the City's share of new development has decreased significantly, as suburban areas have captured an increasing share of the commercial development.**

4.2.3 Transbay Traveler Characteristics

The catchment area for transbay travel across the Golden Gate Bridge in the commute peak, shown in Figure 4.2-2, was determined from the Balanced Transportation Program Trip Table (total person trips) and verified by the Golden Gate Transit rider survey and Bridge license plate checks. Figure 4.2-2 illustrates that 50% of commute peak transbay travel is between southern/central Marin County and northeast San Francisco, and 90% of commute

*SPUR, Impacts of Intensive High-Rise Development on San Francisco, 1975.

**Security Pacific Bank, Research Department; and Gruen Associates, BART Impact Program, Indirect Environmental Impacts, 1976.

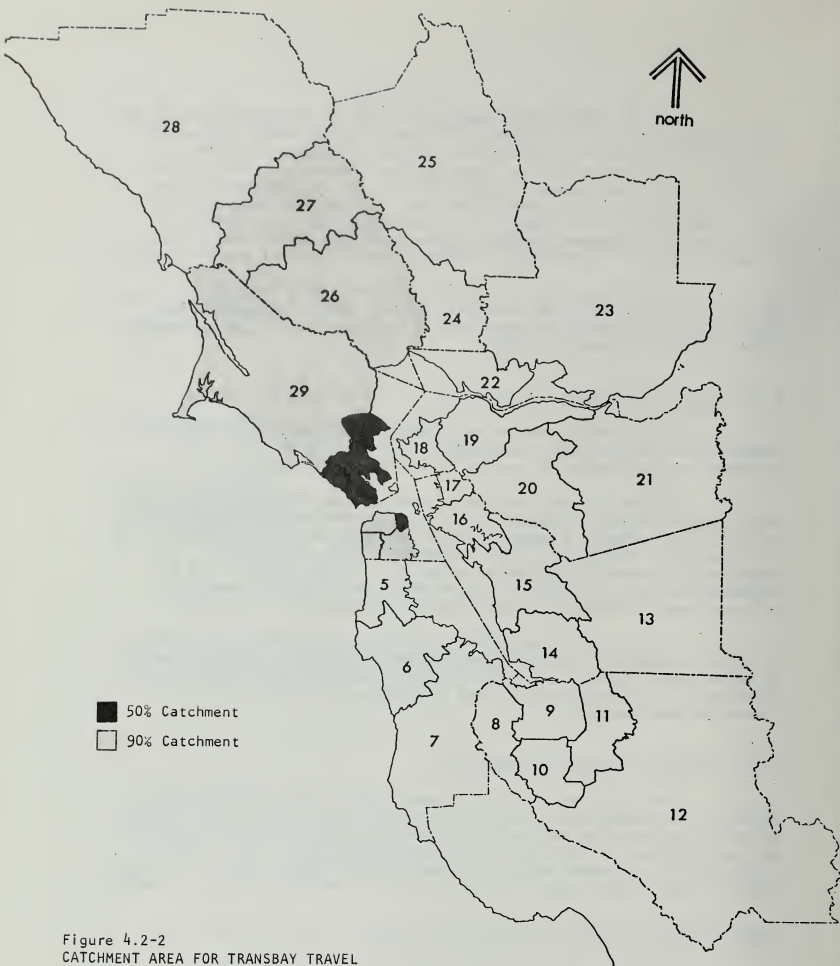


Figure 4.2-2
CATCHMENT AREA FOR TRANSBAY TRAVEL
IN THE COMMUTE PEAK

Source: Marin County Balanced Transportation Program Trip Table,
Transbay Person Trips.

peak Golden Gate Corridor transbay travel is tied to origins and destinations within San Francisco, Marin and Sonoma Counties. The auto and transit catchment areas are fairly coterminous in the peak period; the 90% catchment is slightly more constricted for transit. During the off-peak weekdays, weekends and holidays, the auto catchment area is expanded to include most of Marin and San Francisco Counties in the 50% area and much of California in the 90% area.

The typical Golden Gate Corridor commuter drives daily from his Marin County residence to his job in downtown San Francisco. He is a male, white, 25-to-44-year-old college graduate with family income of approximately \$25,000 annually (see Table 4.2-2). While no specific data was available to compare socioeconomic characteristics of transit and auto commuters, data developed for commuters between San Francisco and the East Bay counties indicate that there is little difference between the two groups of users. The transbay transit user is about five years older, makes \$2,000 to \$3,000 less annual salary and is more likely to be of minority race and female.*

The typical Golden Gate Corridor commuters, whether auto user or transit user, are not totally representative of the resident population in the Bridge catchment area. Corridor commuters are slightly more affluent than the average catchment area resident, perhaps earning \$5,000 more annual family income (see Table 4.2-2). This underrepresentation supports the contention that low income individuals live closer to their places of work than the general population. Table 4.2-2 also indicates that the socioeconomic profile of Marin County residents using Golden Gate Transit bus services varies significantly between peak and off-peak commuters to San Francisco; i.e., off-peak transit users have lower family income and are less likely to have an auto available.

4.2.4 Impacts on Various Socioeconomic Groups

Each toll/fare alternative proposed can be expected to impact various socioeconomic groups differently. This analysis highlights impacts which may be borne by low-income families, racial/ethnic minorities, particular residential locations, and particular work, shop, recreation and social patterns.

(1) Impact on Typical Auto/Transit User. The typical upper middle-income auto commuter journeying daily from his North Bay residence to his San Francisco job would not be dissuaded from making his trip. The additional toll (approximately \$13 a year for the commute book user applicable only to Alternative 1; \$75 a year for the regular bridge toll for both alternatives) would be absorbed by the family budget. The transbay auto commute already costs approximately \$1,100 per year on the

*BART Impact Program, Metropolitan Transportation Commission Bus, Auto and BART User Surveys, October 1974.

TABLE 4.2-2

SOCIOECONOMIC PROFILE OF MARIN COUNTY RESIDENTS USING
GOLDEN GATE TRANSIT BUS SERVICES

<u>Income</u>	<u>Marin Local (%)</u>	<u>Marin/SF Basic (%)</u>	<u>Marin/SF Commute (%)</u>	<u>Factored Marin Residents Using GGT (%)</u>	<u>Marin Census (%)</u>
Under \$4,000	38.2	27.7	2.8	21.1	6.9
\$4,000 to \$9,999	19.2	22.0	12.0	16.6	21.9
\$10,000 to \$11,999	9.0	9.3	4.6	7.2	10.6
\$12,000 to \$14,999	9.2	11.7	11.1	10.5	16.5
\$15,000 to \$24,999	12.7	17.8	30.6	21.3	30.4
\$25,000 to forever	11.7	11.5	38.9	23.3	13.7

Auto Ownership

None	28.3	36.4	0.0	17.6	7.1
1	35.4	40.7	46.8	41.3	44.0
2	24.9	16.3	46.8	32.7	41.2
3 or more	11.4	6.6	6.4	8.4	7.7

Auto Availability

Yes	25.0	35.1	75.4	48.5	-
No	75.0	64.9	24.6	51.5	-

Sex

Male	43.2	53.5	63.2	53.7	49.8
Female	56.8	46.5	36.8	46.3	50.2

Age

Under 5	0.4	0.0	0.0	0.1	7.5
5-14	11.0	2.3	0.8	5.0	19.2
15-19	33.8	9.5	1.7	15.6	8.2
20-24	18.1	22.3	10.2	15.5	7.3
25-44	20.5	41.4	53.4	38.5	29.4
45-59	7.4	12.8	31.4	18.7	17.4
60-64	2.4	3.9	1.7	2.4	3.6
65 and over	6.4	7.8	0.8	4.2	7.4

SOURCE: Analysis of Transit Surveys, December 1975, and
February and May 1976, Ken Hough, GGBHTD

average.* Up to 10% increase in driving costs is relatively small in comparison with the amount already paid and equivalent to less than two year's inflation in transportation costs at 1975-76 rates.

The typical upper middle-income transit commuter journeying daily from his North Bay residence to his San Francisco job also would not be dissuaded from making his trip, although he may be encouraged to switch mode; e.g., auto or carpool.

The additional fare for south and central Marin County bus and ferry users (0 to \$25 a year for a commute book user for Alternatives 1 and 2; \$125 a year for the non-commute book user for both alternatives) is relatively moderate compared with added fare to be paid by North Marin commuters (\$100 a year for commute book; \$250 a year for non-commute book users) and Sonoma County commuters (\$150 to \$175 a year for commute book; \$375 a year for non-commute book users). Assuming use of a discount commute book, the fare increase constitutes a 0 to 8% cost rise for the south and central Marin transit commuter and a 20% to 30% increase for the North Marin and Sonoma County commuter. Thus, the burden of increased transit fare falls principally on the North Marin and Sonoma County transit user and the rider who does not use discount commute books.

The typical upper middle-income carpool user will not be affected by toll increases, since carpools will continue to pass toll free through the toll gate between 6 a.m. and 10 a.m. The number of persons using carpools can be expected to increase, particularly from North Marin and Sonoma County where transit fare increase is greatest.

(2) Impact on Low-Income Families. Transbay travelers with lower family income would be more sensitive to toll increase than the typical auto or transit user. As the average person's income decreases, the value which he places on a dollar increases.

Low-income persons may be particularly impacted by the increased difference between the proposed regular roundtrip transit fares and commute book discount fare, because the low-income rider may not have sufficient cash on hand at the first of each month to afford the commute book investment. The proposed transit fare and auto toll increases would tend to restrict the already limited number and length of trips by persons with low income. Where the transbay travel options become more expensive, the low-income commuter would be encouraged to choose an alternative destination, a less expensive alternate mode (carpools or vanpools) or forego the trip.

Potential impacts would be particularly expected for lower income transit patrons from Sonoma County to San Francisco where the fare increases would be proportionately higher. There is no evidence to suggest

*Based on survey of East Bay Bridge auto users as part of BART Impact Program, the typical East Bay Bridge user pays toll and auto operating cost but no parking charge at his destination; trip length and travel costs should be similar for Golden Gate Bridge users.

that low-income Sonomans presently constitute a significant portion of transbay commuters. However, because the relatively large boost in Sonoma/San Francisco travel fare increases would comprise a greater portion of the income of travelers in the lower-income groups, the action would be regressive in nature.

The only apparent cost-saving option available to low-income transbay travelers would be carpooling. Although this alternative is available in the commute peak, practical difficulties arise in matching trip origins and destinations in off-peak periods.

(3) Impact on Shopping, Recreational, and Social Patterns.

Transportation experience in the Bay Area indicates that auto toll/transit fare increases would more likely impact midday, evening, and weekend auto travelers than rush hour travelers. Off-peak travel is characterized by a higher proportion of shopping, social, recreational and other trips which the traveler generally values as less essential than his routine trip to work or school. The typical transbay traveler may be two to four times as likely to divert to other modes (i.e., carpools or vanpools) or to forego non-essential travel as he is to change travel behavior for work/school trips.

Both Alternatives 1 and 2 would have similar impacts on non-work/school travel. Transit patrons would experience greater impacts than auto drivers due to relatively greater fare increase for transbay travel. Also due to the non-daily or infrequent nature of the non-work/school trips, transit patterns would be less likely to take advantage of savings with commute books.

(4) Impact on Minorities. San Francisco Black, Chicano and Asian residents use the Golden Gate Corridor for reverse commuting and recreational travel particularly. These minority groups will not be able to take advantage of commute book discounts proposed in Alternatives 1 and 2.

Minority groups comprise a relatively small portion of Marin and Sonoma County residents. The concerns of the Black community in Marin City should be addressed under low-income families.

4.2.5 Mitigation of Adverse Socioeconomic Impacts

Inauguration of vanpool service from the proportionately higher transit fare areas in Sonoma County to San Francisco would appear useful in mitigating adverse impacts for those who do not have automobiles available as an alternative. Similarly, carpooling could be encouraged.

Higher tolls/fares could be implemented during peak hours and reduced during off-peak and weekend hours (Alternatives 5 and 6 do this for auto tolls) so that those generally most able to pay (typical upper middle-income daily commuters) would assume provision of a greater share of the additional needed revenue.

Other toll/fare pricing alternatives could be implemented which would shift financial burden on auto users while holding transit fares down. This would allow transit dependents and others to utilize transit in order to minimize travel costs.

Special toll/fare discounts for low-income persons who require use of the bridge to get to work or school might be issued through welfare offices. Care would have to be exercised to avoid black market sales of discount privileges.

Extension of carpool hours to early morning, midday, evening and nighttime hours would enable low-income persons working night shifts or irregular hours to benefit from the same carpool discount as other commuters. Toll-free passage to carpools southbound, 4:00 to 7:00 p.m. is presently being considered by the District. Toll-free carpool privileges for midday and weekend travelers may principally benefit shoppers and recreation travelers.

4.3 Land Use and Regional Plans

4.3.1 Existing Land Use

Bay Area urban land use is primarily located in the plain surrounding San Francisco Bay. San Francisco contains the highest residential and employment density, while Alameda and San Mateo Counties also have substantial density. Outlying suburban areas such as Marin and Sonoma Counties have generally low residential density and few employment opportunities.

4.3.2 Impacts on Existing Land Use

Impacts of the Golden Gate Bridge toll and transit fare changes on land use would result indirectly from effects on travel behavior and potential shifting of demand for housing, retail services, office space, and other business purposes. The proposed toll schedule involves no facility construction or changing of land use presently occupied by the bridge, bridge approaches, and toll collection and maintenance structures. Because changes in traffic speed and perceptible noise appear unlikely to result from the proposed toll schedule, no land use changes would be expected adjacent to bridge approaches.

The type of land use change which could be expected from the proposed bridge toll and transit fare alternatives would be the same in general as the effect experienced in recent years of increased gas prices and bridge congestion. Toll/fare increases, like other increases in transportation cost, provide a disincentive for routine, long-distance travel. Increased travel time during the commute peak places a particular impedance on work travel to San Francisco. The cumulative effect of many forces which constrain long-distance travel might be reduced employment growth in San Francisco in deference to outlying locations near resident

labor force and reduced residential growth in outlying locations which are furthest from employment centers. Since the most rapidly growing outlying employment locations are in the South Bay and residential development tends to follow employment, constraints on travel could shift both employment and residential development southerly, reducing growth in the North Bay, especially Sonoma County.

The magnitude of impact due to increased toll/fare, per se, would be extremely small and probably not measurable, since land use decisions are influenced by a number of factors, not solely transportation costs. Alternatives 1 and 2 would be expected to have similar land use impact.

4.3.3 Commercial and Industrial Land Use Impact

Higher auto tolls and transit fares would appear to slightly augment present market forces at work in the region. Escalating land costs, physical restrictions and peak hour access problems in the center of the region and low cost, vacant land with good access and available utilities and labor force in suburban areas have contributed to a long-term transfer of industrial and commercial firms from the congested core to outlying locations. This is particularly applicable to San Francisco, where regional manufacturing and distribution activity is shifting away from the City to less expensive, more easily accessible outlying locations, particularly east and south of the City. The City's share of regional retail sales is declining with suburban shopping center construction. A recent softening of demand for City office space has accompanied an increase in suburban office park development. In each case, ease of access plays a significant role in the market shifts. As transportation costs for a San Francisco location increase relative to other Bay Area locations, some businesses, particularly those unwilling to pay the high price of central city location or those relying on a sub-regional market, will find it advantageous to relocate outside the City.

San Francisco is only partially in competition with the North Bay Counties or other Bay Area locations for employment, sales and tax ratables however, in large part, San Francisco's continuing employment and business growth arises from its prestigious position vis-a-vis central cities in other U.S. metropolitan areas. Tourism and corporate headquarters, which are the cornerstone of the City's economy, are drawn from a national and international market, unlikely to be swayed by decisions regarding auto tolls or transit fares in the Golden Gate Corridor. The high costs of doing business in San Francisco are accepted in deference to the "quality of life" available for corporate executives and the image conveyed by a San Francisco letterhead.

Corporate offices and tourist accommodations (e.g., hotels, restaurants) can be expected to continue paying top price for prime property, regardless of toll/fare increases. Businesses which serve the office and tourist market will continue to be tied to a San Francisco location (e.g., branch banks, retail shops). Higher intracity transportation costs

as proposed by the GGBHTD suggest decrease in demand for commercial land use would be focused on older commercial and industrial properties in non-prestige locations.

4.3.4 Residential Land Use Impact

In general, housing demand follows employment opportunity. With only minimal shift in employment expected from San Francisco to outlying areas, only minimal housing impact would be expected. Any decentralization in employment caused by toll/fare increase would tend to ease housing pressures in locations close to San Francisco as employees seek greater housing value further from the City, particularly in Sonoma County. When a firm moves to San Rafael, for example, an employee could commute at lower cost from northern Marin or Sonoma County. Demand for housing in the outlying North Bay communities would increase home construction and/or prices of homes.

4.3.5 Consistency with Regional Plans

The Regional Transportation Plan adopted by the Metropolitan Transportation Commission in 1974 and subsequently amended, specified fifteen objectives, several of which imply action of the type proposed by the proposed auto toll and transit fare schedule. Impact differences between Alternatives 1 and 2 are negligible.

OBJECTIVE A: Transportation programs shall consist of well-coordinated multi-modal systems to meet demonstrated travel demand which is consistent with policies of other regional agencies. Additional toll/fare revenues may be used to fund bus, ferry, bridge, and highway service; i.e., a multi-modal approach.

OBJECTIVE B: Transportation programs will be designed to reduce dependence on the automobile as a transportation mode. Additional toll/fare revenue would be used to fund transit improvements, thereby decreasing necessity to use automobiles.

OBJECTIVE C: More efficient utilization of existing transportation facilities shall be explored as an alternative to construction of new facilities. In addition to funding transit operations, alternative toll/fare schedules would encourage use of carpools, increasing bridge "person trip" carrying capacity.

OBJECTIVE D: Transportation programs shall be designed to conserve energy resources insofar as this is consistent with the provision of necessary and adequate transportation service. Alternative toll/fare schedules would increase the volume and miles of vehicle travel in the commute peak, thereby increasing energy consumption compared with baseline conditions. At the same time, the toll/fare increase would raise revenue necessary to avoid transit service cutbacks.

OBJECTIVE E: Transportation programs shall be designed to enhance the physical environment, or to avoid or to minimize adverse impact on the physical environment. Alternative toll/fare schedules would increase vehicle travel, thereby increasing air pollution compared with baseline conditions. On the other hand, revenue generated would support transit, thereby avoiding service cutbacks and resulting air pollution.

OBJECTIVE F: Transport programs shall provide for the allocation of financial resources on a multi-modal basis according to transportation priorities set by the Commission. The additional toll/fare revenue would be used to fund bus, ferry, highway and bridge operating expenditures; i.e., a multi-modal funding approach.

The above land use impacts appear consistent with some objectives and in conflict with other objectives of the ABAG Regional Plan (city-centered concept). The general nature of the plan and inability to predict land use impacts precisely make evaluation extremely judgmental. Analysis of compatibility with each of the Regional Plan's six objectives follows (ABAG policy underlined below). Impact differences between Alternatives 1 and 2 are negligible.

(1) Identifiable concentration of urban development around community centers. Although higher travel costs would tend to increase activity concentrations, the change in pricing is on selected links only, thereby diffusing impact. Continued gasoline rationing, for example, would have a much greater concentration effect. Location of activities is believed to be largely a function of zoning and city services rather than transportation pricing.

(2) Extensive open space and conserved areas. Activity concentration via increased transport cost facilitates open space preservation. Again, zoning and city services are major catalysts.

(3) Improved environmental quality. Increased auto travel across the Golden Gate Bridge would degrade air quality and increase energy consumption compared with baseline conditions, but revenue will support transit services. Business exodus from San Francisco to outlying areas is likely to be counter-productive (open space consumed for urban development, higher per capita vehicle travel).

(4) A multiple-mode transportation system. Increased toll/fare revenue would finance transit services in support of this objective.

(5) An operational regional organization. The GGBHTD is one of several regional operating agencies in the transportation and environmental sphere, including: Metropolitan Transportation Commission, Bay Area Rapid Transit District, California Toll Bridge Authority, Bay Area Air Pollution Control District,

Bay Area Sewer Services Agency, Bay Conservation and Development Commission, and California Coastal Commission. Coordination among these agencies is provided by joint staff committees and some overlapping board membership. Proposals have been presented by Assemblyman John Knox and others to unify various regional agencies within a single operation organization.

(6) Strong intergovernmental cooperation, coordination, and citizen participation. Procedures for adoption of the District's Long-Range Transportation Plan (April 1975) and certification of this environmental impact report provide opportunities for cooperation, coordination, and citizen participation.

4.3.6 Consistency with Marin County-wide Plan

(1) Discourage rapid or disruptive population growth, but encourage social and economic diversity within neighborhoods and in the County as a whole. Under the controls recommended by the Plan, Marin's population would not exceed 285,000 by 1990, compared with 389,000 in an uncontrolled market. Higher tolls/fares would be supportive of a low county growth rate called for by the plan, though magnitude of impact may be negligible.

(2) Achieve greater economic balance for Marin, by increasing the number of jobs and the supply of housing for people who will hold them. Marin should strive to become less a bedroom community and a more self-sufficient economic unit. Plan projections indicate that Marin should employ 94,400 in 1990, compared with 57,700 in 1970. Higher tolls/fares would tend to support greater economic self-sufficiency, though magnitude of impact may be negligible.

(3) Achieve high quality in the natural and built environments through a balanced system of transportation, land use, and open space. Under the Plan, 37% of the land in the Eastern Urban Corridor would be developed by 1990, compared with 45% under the unconstrained market. In 1970, 30% of this corridor was developed. The proposed toll/fare increase would support transit services; i.e., balanced transportation. Land use and open space are not likely to be impacted by toll/fare increases.

Table 4.3-1 provides a comparison of the County-wide Plan's major elements, current trends, and a composite of adopted community plans.

4.3.7 Consistency with Sonoma County General Plan*

(1) The County's Community Centered Land Use Plan and Transportation Element incorporate a policy of holding out-commuting

*Source: Sonoma County Planning Department, Community Development Element of Sonoma County General Plan, "Summary Volume", November 1975, pp. 62, 100.

at or near the present proportion of the work force. Neither the Land Use Plan nor the Transportation Element are designed to encourage the current trend toward an increase in the rate of commuting. A goal to discourage out-commuting was drafted by the Board of Supervisors and approved by the Transportation Committee. The General Plan Advisory Committee disagreed with this Statement, however, and preferred that commuting should be monitored rather than discouraged.

(2) The Sonoma County Transportation Element's recommendations for encouraging high levels of transit usage in the Highway 101 corridor is in keeping with the policies of Marin County and MTC. Long-range plans call for a program of increased transit service in the Golden Gate Corridor. Emphasis is placed on orienting transit improvements to Sonoma-Marin commuters as well as those commuting to San Francisco.

4.3.8 Consistency with the San Francisco City and County Transportation Element of the General Plan

The following policies listed in the plan advocate increased use of transit which the proposed toll/fare increase would financially support. Fare increases would slightly reduce transit use compared to baseline conditions.

(1) POLICY 1: Build and maintain rapid transit lines from downtown to all suburban corridors and major centers of activity in San Francisco. The city and much of the region should continue to be committed to a transit-first policy with respect to intercity commuter travel.

(2) POLICY 2: Where significant, transit service as provided by buses, bridges and freeways should have exclusive bus lanes. Transit lines can provide more efficient service by operating on their own rights-of-way. These can be instituted on bridges, freeways, and thoroughfares, leading into the City, such as on the Golden Gate Bridge and Waldo Grade.

(3) POLICY 3: Provide transit service from residential areas to major employment centers outside the downtown area. Reverse commuting to areas other than downtown is increasing and places new requirements on the transit system. The proportion of City residents employed outside the City is increasing rapidly, from 6% in 1960 to 20% in 1970. The City should pursue means of providing the transit for residents where it is not available, such as to the southern Peninsula.

(4) POLICY 4: Continue ferries and other forms of water-based transportation as an alternative mode of travel between San Francisco and the North Bay. For communities in Marin County, ferry or high-speed watercraft offers an alternative means of travel to downtown. Whether bus or rail is the major transit

mode to Marin, ferry service should be continued, as it offers an efficient and pleasant way to commute. It also provides a means to reduce weekend and summer automobile congestion in Marin's bayside communities. As ridership and location warrant, water-based transportation should be developed to other locations in the Bay Area.

4.3.9 Mitigation of Adverse Land Use Effects

To counter potential dispersion of employment and other land use from San Francisco would require efforts by San Francisco to hold commercial and industrial activities and efforts in outlying areas to restrict development of major new employment/activity centers. The City of San Francisco might lower property taxes or offer similar financial incentives for manufacturing, distribution, retail and other more sensitive employment to remain in the City. New major employment in the suburbs might be stemmed by regional review and control over indirect air pollution sources. The rationale for control of indirect pollution sources is that new employment activity centers in suburban areas generate more and longer vehicle trips per capita than central city employment/activity centers, and in turn encourage spreading of urban development into the hinterlands. Suburban cities and counties themselves could clamp tight restrictions on growth generators (shopping centers, college campuses, industrial parks) as contributing to urban sprawl. Current property and sales tax structure parks could be revised (e.g., regional tax sharing) to restrict intercity competition for tax rateables, a major force undermining rational land use planning.

Table 4.3-1

SUMMARY OF COMPARATIVE MAJOR IMPACTS IN MARIN COUNTY:
COUNTYWIDE PLAN, CURRENT TRENDS, COMPOSITE OF ADOPTED PLANS

	Countywide Plan	Current Trends	Composite of Adopted Plans (1970)	
SOCIAL	1. Growth rate (1970 pop. 209,574)	Controlled rate: 1990 pop. 300,000	No direct control: 1990 pop. 364,000 No control over rate: Ultimate pop. 768,000	
	2. Housing for low and moderate-income families. (1970 mix: 36% high, 44% middle, 20% low)	Would retain 1970 mix in 1990	Rising housing prices, 1990 mix: 53% high, 40% middle, 7% low No information	
	3. Residential densities	Increased at selected accessible sites only; open land retained; sprawl reduced	Extensive increases accompanied by low-density sprawl	Controlled increases accompanied by low-density sprawl
	4. Jobs (54% Marin resident/workers employed here in 1970)	Improved economic balance: 68% Marin resident/workers employed here in 1990	Continued economic imbalance: 52% Marin resident/workers employed here in 1990	No information
ECONOMIC	5. Business locations	Concentrate in activity centers, development areas, serving entire county	Development in sprawl and strip patterns, not concentrated	Development in each community, unrelated to countywide needs
	6. Business types	Businesses to employ Marin residents, especially underemployed groups. Encouragement of agriculture, non-polluting industries.	Heavy reliance on in-commuting; decline of agriculture; limited business growth	Emphasis on non-polluting businesses; no information on job types, decline of agriculture
ENVIRONMENTAL	7. Water quality	Strict development controls near all waterways, including streams	Controls over ocean and bay shores only	No special standards for development near waterways
	8. Air quality (transportation: 1,005,680 vehicle trips/day in 1969)	Less pollution through more transit, less reliance on cars (1,527,200 vehicle trips/day in 1990)	More pollution because of inadequate public transportation (1,833,490 vehicle trips/day in 1990)	Increasing pollution; inadequate plans for public transportation (4,102,500 vehicle trips/day under ultimate development)
	9. Geologic and soil conditions	Stricter development controls to minimize geologic hazards	Some development controls to minimize geologic hazards	Limited development controls (e.g. slope policy) in relation to geology
	10. Plant and animal life	Species preserved through open space program, EIR	No direct means of preservation	Some preservation through limited open space programs
	11. Noise conditions	Noise element to be prepared		
	12. Visual conditions (67,500 acres in publicly secured open space, 1970)	Extensive open space to preserve community appearance provide recreation (136,230 acres in 1990)	Only presently scheduled major public parks would be added to open space (101,410 acres in 1990) Limited proposals for public open space (23,000 acres under ultimate development)	

SOURCE: Reference 17, page A-4

4.4 Air Quality

4.4.1 Existing Air Quality

Air quality may be assessed in terms of the concentrations of various pollutants. Air pollutants most commonly measured are (1) carbon-monoxide (CO); (2) oxides of nitrogen (NO_x); (3) oxidant, primarily ozone (O₃); (4) hydrocarbons (HC); (5) sulfur dioxide (SO₂); and (6) particulates.

When air quality is expressed in terms of the frequency that certain levels are equaled or exceeded, the levels are based on either state or federal standards. These standards are summarized in Table 4.4-1. In the Bay Area, the standards most frequently violated are those for oxidant and carbon-monoxide. In 1976, according to the Bay Area Air Pollution Control District, oxidant standards were exceeded on at least two days at every monitoring station; carbon-monoxide standards were exceeded at least once during the year at one-half of the stations. By contrast, only two stations (of eight) showed violations of nitrogen dioxide (one of the oxides of nitrogen) standards, and on only one day at each of those. Only one station (of nine) had a SO₂ violation.

Carbon-monoxide typifies primary pollutants that are emitted directly into the atmosphere from motor vehicles. It is most inert so that the observed concentrations represent only the effects of dilution in the atmosphere. Motor vehicles constitute the most important source of CO, as shown in Figure 4.4-1. Thus, it is not surprising that the highest CO concentrations are in the vicinity of major roadways such as Highway 101, including the San Francisco and Marin County approaches to the Golden Gate Bridge.

Oxidant, a component of photochemical smog, is a by-product of NO_x and HC, formed in the presence of sunlight downwind from the primary NO_x and HC emissions. Motor vehicles contributed between 60% and 70% of the precursors of smog in 1971 (Figure 4.4-1). Figure 4.4-2 shows the distribution of average peak hour oxidant concentrations in the Bay Area. An area of low average oxidant concentration is centered over San Francisco. Values tend to increase as one goes away from San Francisco northwest toward Sonoma and Napa Valley; northwest through the Carquinez Strait; eastward through Dublin and Niles Canyon and into the Livermore Valley; and southeasterly along the sides of the Bay into the Santa Clara Valley.

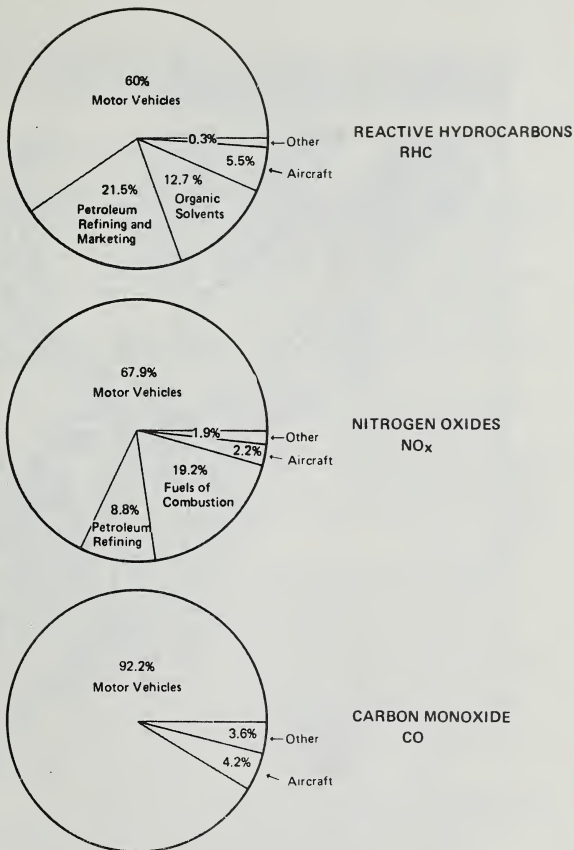
Two conflicting trends are operating to affect future transportation related emissions of air pollutants. First, the number of people in San Francisco Metropolitan Region is increasing. Second, improved vehicle emission controls may reduce the importance of the private automobile as a pollution source. Greater use of transit and carpools may also reduce emissions.

According to analyses by the Bay Area Air Pollution Control District (BAAPCD), the effects of emission controls have more than offset

TABLE 4.4-1
AMBIENT AIR QUALITY STANDARDS

<u>Pollutant</u>	<u>Averaging Time</u>	<u>CALIFORNIA STANDARDS</u>	<u>NATIONAL STANDARDS</u>	
		<u>Concentration</u>	<u>Primary¹</u>	<u>Secondary²</u>
Oxidants	1 hour	0.10 ppm	0.08 ppm	Same as Primary Standards
Carbon-monoxide	12 hour	10 ppm	-	Same as Primary Standards
	8 hour	-	9 ppm	
	1 hour	40 ppm	35 ppm	
Nitrogen Dioxide	Annual Average	-	0.05 ppm	Same as Primary Standards
	1 hour	0.25 ppm	-	
Sulfur Dioxide	Annual Average	-	0.03 ppm	-
	24 hour	0.04 ppm	0.14 ppm	-
	3 hour	-	-	0.5 ppm
	1 hour	0.05 ppm (1310 ug/m ³)	-	-
Suspended Particulate Matter	Annual Geometric Mean	60 ug/m ³	75 ug/m ³	60 ug/m ³
	24 hour	100 ug/m ³	260 ug/m ³	150 ug/m ³

1. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health. Each state must attain the primary standards no later than three years after that state's implementation plan is approved by the Environmental Protection Agency (EPA).
2. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after implementation plan is approved by the EPA.



Source: TRW, Air Quality Implementation Plan Development for Critical California Regions. San Francisco Bay IntraState AQCR, for EPA, July, 1973

* San Francisco IntraState Air Quality Control Region

Figure 4.4-1
SAN FRANCISCO BAY AREA AQCR* MAJOR CONTRIBUTORS
1971 BASE YEAR EMISSION INVENTORY

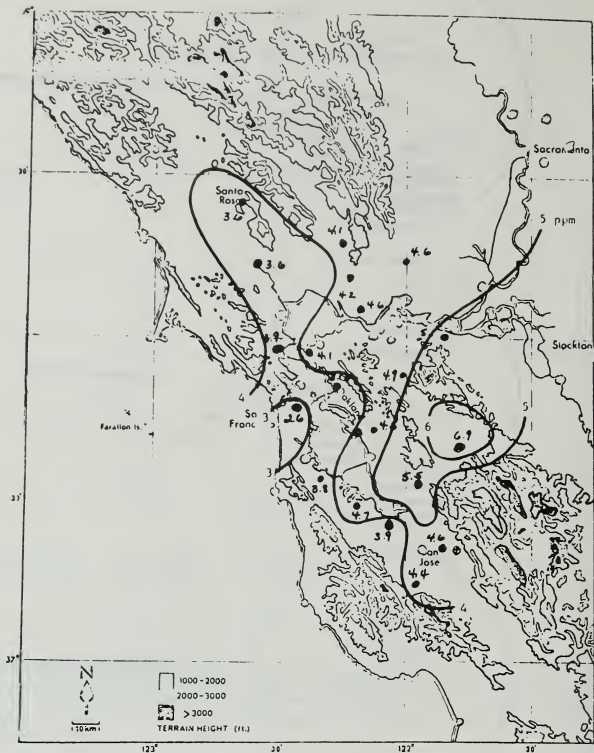


Figure 4.4-2
AVERAGE PEAK-HOUR OXIDANT CONCENTRATION
PPM (1970-1972)

Source: Metropolitan Transportation Commission, Draft Environmental Impact Report - MTC Regional Transportation Plan, March 1974, Appendix.

the effort of population increase. The trend is toward lower concentrations. The downward trend in emissions from vehicles should continue, although recent changes in the laws governing mandatory controls would slow the rate of improvement.

4.4.2 Air Quality Impacts

Buses emit higher levels of most contaminants than do automobiles, as shown in Table 4.4-2. Emissions from a bus are usually less than those from the autos it replaces where bus occupancy averages ten or more. The effects of fewer vehicles on the highways and the concomitant reduced congestion may be small at off-peak hours, when traffic travels at near maximum speed, but quite important during the highly congested peak hours. Table 4.4-3 indicates the increase in vehicle miles traveled for transbay toll/fare Alternatives 1 and 2 compared to baseline conditions. The table indicates emissions for primary pollutants, over a five-year period. More detailed information, including methodology and assumptions, is included in Appendix C.

Although Table 4.4-3 reveals increases in VMT and emissions with implementation of either of Alternatives 1 or 2, it should be remembered that baseline conditions would be impossible to maintain over the coming years. That is, the GGBHTD's current financial status could not support existing levels of transit service and bridge maintenance into future years without toll/fare increases. The proposed toll/fare increases avoid a situation in which transit services would be cut back and auto volume and associated air pollution would increase as a result.

With the two proposed toll/fare schedules, carbon-monoxide (CO) emissions would increase by .26 thousand tons per year, over baseline conditions, by 1977/78 with implementation of Alternative 1, and by .19 thousand tons per year with Alternative 2. Five-year projections indicate an increase of .14 thousand tons per year over 1981/82 baseline conditions with Alternative 1 and .10 thousand tons per year with Alternative 2. These increases appear insignificant when considered in the context of a predicted overall decrease in transbay CO emissions of at least 12 thousand tons per year between 1976/77 and 1981/82, due to manufacture of "cleaner" automobiles. Significance is further diminished by the fact that the projected 0.10-0.26 thousand tons increase in CO contributed on the order of 0.01% to regional CO emissions.*

A slight increase in peak hour travel for the two alternatives suggest a small increase in air pollution concentrations beside the bridge approaches. However, this condition may be mitigated by reduction of delay (auto idling) at the toll booths during the a.m. peak due to the proposed even fare (\$1.00) tolls or coupons. Currently, collection of the \$.75 toll usually requires changing a dollar bill. Up to one minute per auto is expected to be saved by expediting toll collection.

*Bay Area Air Pollution Control District 1975 District-wide Emissions Inventory

TABLE 4.4-2

1977 EMISSION FACTORS FOR BUS AND OTHER HIGHWAY VEHICLES (18 mph)

	<u>Carbon- Monoxide</u>	<u>Hydro- Carbons</u>	<u>Nitrogen Oxides</u>	<u>Sulfur Oxides</u>	<u>Particu- lates</u>
	g/mi	g/mi	g/mi	g/mi	g/mi
<u>Diesel Bus</u>					
49-passenger	28.7	4.6	20.9	2.8	1.3
29-passenger	28.7	4.6	20.9	2.8	1.3
<u>Gasoline Bus</u>					
29-passenger	228.	15.3	10.7	0.9	0.4
<u>Van</u>					
8-12 passenger	65.3	5.9	4.4	0.2	0.2
<u>Average Highway Vehicle**</u>	48.3	7.2	4.6	0.2	0.5

*0.5% Sulfur content assumed.

**Reflects 80% light-duty gasoline, 12% light-duty truck, 5% heavy-duty gasoline and 3% heavy-duty diesel.

SOURCE: Supplement No. 5 to AP42, U.S. Environmental Protection Agency, December 1975 for internal combustion pollutants.

TABLE 4.4-3

**IMPACT OF PROPOSED TOLL/FARE INCREASES ON TRANSBAY AIR POLLUTANT
EMISSIONS (Increase Compared to Baseline)**

Alternative	Total VMT Increase (in millions of miles per year)*	Emissions Increase (in thousands of tons per year)*		
		CO	HC	NO _x
Alternative 1				
1977/78	8	0.26	0.05	0.04
1978/79	8	0.22	0.04	0.02
1979/80	9	0.20	0.03	0.02
1980/81	9	0.17	0.04	0.01
1981/82	9	0.14	0.03	0.01
Alternative 2				
1977/78	6	0.19	0.04	0.02
1978/79	6	0.16	0.03	0.01
1979/80	6	0.14	0.03	0.02
1980/81	6	0.12	0.03	0.01
1981/82	7	0.10	0.02	0.01
Alternative 3				
1977/78	9	0.28	0.06	0.04
1978/79	9	0.24	0.05	0.03
1979/80	9	0.21	0.03	0.02
1980/81	10	0.18	0.04	0.03
1981/82	10	0.14	0.03	0.01
Alternative 4				
1977/78	9	0.34	0.07	0.04
1978/79	10	0.26	0.06	0.03
1979/80	11	0.26	0.04	0.03
1980/81	12	0.22	0.05	0.02
1981/82	12	0.18	0.04	0.01
Alternative 5				
1977/78	-34	-1.05	-0.17	-0.15
1978/79	-35	-0.92	-0.16	-0.15
1979/80	-35	-0.80	-0.15	-0.14
1980/81	-36	-0.73	-0.12	-0.12
1981/82	-37	-0.59	-0.11	-0.13
Alternative 6				
1977/78	-42	-1.29	-0.21	-0.18
1978/79	-43	-1.13	-0.19	-0.18
1979/80	-43	-0.98	-0.19	-0.17
1980/81	-44	-0.85	-0.15	-0.16
1981/82	-45	-0.73	-0.13	-0.15
Alternative 7				
1977/78	0	0	0	0
1978/79	27	0.72	0.13	0.07
1979/80	40	0.85	0.12	0.09
1980/81	49	0.89	0.20	0.09
1981/82	57	0.80	0.18	0.04

*Baseline estimate for 1977/78: 857 million VMT, 26.91 thousand tons of CO, 4.53 thousand tons of HC, and 3.93 thousand tons of NO_x. For 1981/82: 937 million VMT, 15.20 thousand tons of CO, 2.82 thousand tons of HC, and 3.06 thousand tons of NO_x.

Source: Calculations performed by Golden Gate Bridge, Highway and Transportation District using California Air Resources Board emission factors. See Appendix C for documentation.

Similarly, the proposed toll/fare schedules would generate on the order of a 0.01% increase in regional nitrogen oxides (NO_x) and hydrocarbons (HC) over baseline conditions. Nitrogen oxide emissions would increase by .04 thousand tons per year by 1977/78 and .01 thousand tons per year by 1981/82, over baseline conditions, with implementation of Alternative 1. The increases associated with Alternative 2 would be .02 thousand tons per year by 1977/78 and no increase by 1981/82 over baseline conditions. Hydrocarbon emissions would increase over baseline conditions: .05 thousand tons per year by 1977/78 and .03 thousand tons per year by 1981/82 with the toll/fare schedule for Alternative 1. The increase would be .04 thousand tons per year by 1977/78 and .02 thousand tons per year by 1981/82 with implementation of Alternative 2.

The present technology in emissions monitoring instruments is such that it would be highly unlikely that computed emissions impacts could be reliably detected by roadside monitoring stations. For this reason and the seemingly small change in quantifiable emissions relative to baseline and regional emissions inventory, air quality impacts appear insignificant.

Of all the alternatives evaluated, Alternatives 1 thru 4 have basically the same implications for air quality; i.e., very slight increases in emissions overshadowed by substantial reduction in emissions due to vehicle controls and BAAPCD control of point sources. Alternatives 5 and 6 would result in a reduction in transbay vehicle volume during the commute peak of 3% to 5% which would be reflected in a similar percentage decrease in transbay emissions generated.

4.4.3 Mitigation of Adverse Air Quality Impacts

To reduce localized air pollution build-up along Highway 101, particularly at the bridge approaches, due to projected increases in VMT, measures to cut down the increase in VMT could be considered. A toll/fare schedule more supportive of mode shift from auto to transit and carpool (e.g., Alternatives 5 and 6), could be considered.

4.5 Energy

Public concern about the availability and use of energy resources was aroused by the gasoline shortage during the winter of 1973-74. While the immediate cause of this shortage was an embargo by the oil exporting nations, the sudden hardship created by the shortage generated a reappraisal of long-term domestic and foreign reserves of petroleum and prompted questions concerning present and projected rates of consumption.

A number of disturbing facts have been established in the course of this reappraisal:

(1) Depletion of Domestic Oil Reserves: At current rates of consumption, the United States will deplete its domestic oil reserves within 40 to 60 years, according to studies conducted

by the Federal Energy Administration, the Department of Interior and the Executive Office of the President. Another study conducted by the National Research Council of the National Academy of Sciences reduced this forecast depletion to 25 years. Moreover, if consumption levels continue to grow at the rate that they have in the past, domestic reserves could be depleted even sooner.

(2) Consumption of Oil by Transportation Sector: Transportation uses accounted for 53% of all petroleum consumed in the United States in 1973*. Cars, trucks, and buses consumed about 77% of the petroleum used in transportation, or about 42% of the total consumed for all purposes.** Highway vehicles are thus the largest single users of petroleum in the United States.

(3) Reduction in Vehicle Energy Efficiency: The average fuel economy of the entire fleet of operating automobiles in this country has declined from 15.0 mpg in 1950 to 13.5 mpg in 1972. This decline can be attributed to increased vehicle size and weight, a greater demand for accessories such as air conditioners, automatic transmission and power steering, and modifications required to meet mandatory emission control and safety requirements.***

These findings have stimulated a greater concern for the conservation of petroleum resources and a conviction that the transportation sector offers numerous opportunities for reducing the rate of energy consumption.

Studies have shown that transportation-related energy consumption is influenced by a number of variables:

VEHICLE: Weight, body size and shape, tires (type, size, inflation), engine size (horsepower) and design; accessories, maintenance and repair.

ROADWAY: Distance, gradients, horizontal curvature, speed and speed changes (stops and slowdowns), roadway surface and extensiveness of high-type highway network.

*U.S. Department of the Interior, Energy Perspectives; (Washington, D.C.; U.S. Government Printing Office, 1975)

**L.L. Liston and J.E. Ullman, "Are We Running Out of GAS?"; Paper presented at the North American Gasoline Tax Conference, (Biloxi, Mississippi; October 1972)

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Similarly, the proposed toll/fare schedules would generate on the order of a 0.01% increase in regional nitrogen oxides (NO_x) and hydrocarbons (HC) over baseline conditions. Nitrogen oxide emissions would increase by .04 thousand tons per year by 1977/78 and .01 thousand tons per year by 1981/82, over baseline conditions, with implementation of Alternative 1. The increases associated with Alternative 2 would be .02 thousand tons per year by 1977/78 and no increase by 1981/82 over baseline conditions. Hydrocarbon emissions would increase over baseline conditions: .05 thousand tons per year by 1977/78 and .03 thousand tons per year by 1981/82 with the toll/fare schedule for Alternative 1. The increase would be .04 thousand tons per year by 1977/78 and .02 thousand tons per year by 1981/82 with implementation of Alternative 2.

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***Federal Energy Administration, Project Independence Report, (Washington, D.C.; U.S. Government Printing Office, 1974)

TRAFFIC: Volumes, level of service, composition (automobile, bus, freight-hauling vehicles).

OWNER/OPERATOR: Driving habits, trip purposes, income.

SOCIOECONOMIC: Population, income distribution, age distribution, real costs of capital investment and expenses of vehicle.

LAND USE PATTERNS: Density and development of pattern.

MODAL ALTERNATIVES: Availability of public transportation, provisions for bicycles and pedestrians, railroads, air and water transportation.

WEATHER AND ALTITUDE: Weather effects on speed, effects of altitude on air resistance and engine performance.

PUBLIC POLICY: Taxation and pricing of vehicles, fuel rationing, speed limitations, programs to increase vehicle occupancy, transportation investment programs, energy efficiency standards, and air and noise pollution control programs.

4.5.2 Energy Impacts

Table 4.5-1 compares energy efficiency for alternative transportation modes. Increasing use of transit, particularly for the journey-to-work, would produce a notable decrease in the consumption of petroleum products by shifting the user from a transportation mode which requires heavy use of fuel--the automobile--to a mode which is significantly more energy efficient--public transit. A constraint to programs encouraging a shift to public transit is the limited resources for financing transit--a constraint which the proposed toll/fare schedule intends to diminish. The free carpool lane on the bridge during the peak hours serves to encourage reduced vehicle travel by increasing average vehicle occupancy.

Table 4.5-2 estimates increased vehicle miles traveled (VMT) and fuel consumption for the proposed alternative toll/fare schedules, compared to baseline conditions. The relative increases in both VMT and fuel consumption appear slightly less for Alternative 2 than Alternative 1, thus making Alternative 1 more energy efficient. The 0.38/0.57 million gallons per year increase in fuel consumption is less than a 1% increase in fuel consumption attributable to transbay travel. The increase is more than offset by the transbay fuel savings attributable to manufacture of more energy-efficient vehicles.

Of the various toll/fare alternatives evaluated, Alternatives 1 thru 4 would all increase fuel consumption in approximately the same manner. Alternatives 5 and 6 would decrease transbay vehicle use and corresponding energy consumption by 3% to 5%.

Measures to reduce the increases in energy consumption would focus on reduction of VMT; i.e., encouragement of carpools, vanpools, and

TABLE 4.5-1

OPERATING ENERGY EFFICIENCY FOR TRANSIT AND AUTOMOBILE

<u>Vehicle</u>	<u>Weight</u>	<u>Seats</u>	<u>BTU/VM</u> ^(c)	<u>BTU/SM</u> ^(d)	<u>BTU/PM</u> ^(b)	<u>Assumptions</u>
Fixed Route Bus	20,000	50	37,750	755	3,020	3.6 MPG
Express Bus	20,000	50	29,600	592	2,368	4.8 MPG
Demand Responsive Bus	(a)	19	(a)	1,703	6,812	3.2 MPG
Jitney	8,000	8	17,040	2,130	8,520	8 MPG
Rail Rapid Transit	58,000	72	58,500	812	3,248	Projected, BART
Gas Auto (Small)	2,000	4	4,750	1,187	4,748	
Gas Auto (Large)	4,000	5	9,500	1,900	7,600	

(a) Not available

(b) Assumes a 25% load factor. (BTU's per passenger mile.)

(c) British Therman Units per vehicle mile

(d) BTU's per seat mile

SOURCE: "Energy Use of Public Transit Systems" by Timothy J. Healy, Ph.D., August 1, 1974.

TABLE 4.5-2
IMPACT OF TOLL/FARE ALTERNATIVES ON FUEL CONSUMPTION
(Increase Compared with Baseline Conditions)

Year	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Alternative 6		Alternative 7	
	Total VMT*	Total Fuel**	Total VMT*	Total Fuel**	Total VMT*	Total Fuel**	Total VMT*	Total Fuel**	Total VMT*	Total Fuel**	Total VMT*	Total Fuel**	Total VMT*	Total Fuel**
1977/78	8	0.57	6	0.41	9	0.41	11	0.72	-34	-2.44	-42	-2.99	0	0
1978/79	8	0.54	6	0.39	9	0.38	10	0.69	-35	-2.45	-43	-3.00	27	1.24
1979/80	9	0.54	6	0.38	9	0.39	11	0.71	-35	-2.45	-43	-3.01	40	2.03
1980/81	9	0.55	6	0.38	10	0.38	12	0.71	-36	-2.44	-44	-3.00	49	2.36
1981/82	9	0.52	7	0.38	10	0.38	12	0.67	-37	-2.42	-45	-2.95	57	2.78

*Millions of vehicle miles traveled transbay. Baseline conditions are 857 million VMT in 1977/78 and 937 million VMT in 1981/82.

**Millions of gallons of fuel consumed (gas and diesel) transbay. Baseline energy consumption is 63.87 million gallons of fuel in 1977/78 and 63.87 million gallons of fuel in 1981/82.

Source: Calculations performed by Golden Gate Bridge, Highway and Transportation District.
See Appendix C for documentation.

bus over regular auto use. Such measures suggest consideration of other toll/fare schedules discouraging single-occupancy vehicular use.

4.6 Noise

(1) Existing Noise Conditions. Roadside noise levels may be expressed as either L_{dn} , day-night weighted noise levels in which average nighttime (10 p.m. to 7 a.m.) noise levels (dBA) are increased by 10 dBA; or CNEL, community noise equivalent level which also involves weighting of early evening and nighttime noise to reflect greater resident sensitivity. L_{dn} is used by the U.S. Environmental Protection Agency and closely approximates CNEL used by the State of California.

(2) Noise Impacts. Figure 6.6-1 illustrates the relationship of traffic volume, average speed and distance from the roadway in determining roadside noise, expressed in CNEL. Day-night weighted noise levels (CNEL) 100 feet from the roadway are currently on the order of 80 dBA for the Golden Gate Bridge. Note that a 30% or more change in volume is required to raise or lower CNEL or L_{dn} by dBA. Likewise off-peak traffic speed overrides low noise readings that may be recorded in congested peak periods.

Noise impacts could result from changes in traffic volumes or traffic conditions, changes in the location of traffic flow relative to noise sensitive areas and changes to transit operations. According to GGBHTD preliminary analyses, the proposed alternatives will produce a small change in traffic volumes and traffic conditions. Implementation of all toll/fare schedules should not result in the relocation of any traffic flows. The Proposed Action would appear, therefore, to have no adverse impact on ambient noise conditions. By providing the means to maintain the District's transit services, however, the proposed toll/fare increase would avoid commute peak traffic diversion and associated noise on parallel routes; e.g., Wolfe Grade, Magnolia, Corte Madera Avenue, Camino Alto, Shoreline Highway and Bridgeway.

4.7 Effects Found Not to Be Significant

A copy of the District's report, "Initial Environmental Study of Proposed Toll and Fare Increases," April 7, 1977, is attached in its entirety to this report. A "Summary of Potential Environmental Effects" is presented in Table 4 (pages 16 and 17) of the Initial Environmental Study. Identification of the nature of potentially significant environmental effects is performed in Chapter 3 of the Initial Environmental Study, Sections 3.1 thru 3.6. Detailed assessment of these effects is presented in Sections 4.1 thru 4.6, respectively, of this report.

Section 3.7 of the Initial Environmental Study briefly reviewed those areas of environmental concern for which the Proposed Action has no potential impact. They are as follows:

- *Services and Utilities
- *Fiscal Impacts
- *Construction
- *Geology and Soils
- *Water Resources
- *Topography
- *Climate
- *Wildlife and Vegetation
- *Visual, Aesthetic and Archeological Resources
- *Mineral, Agricultural and Recreational Resources
- *Human Health

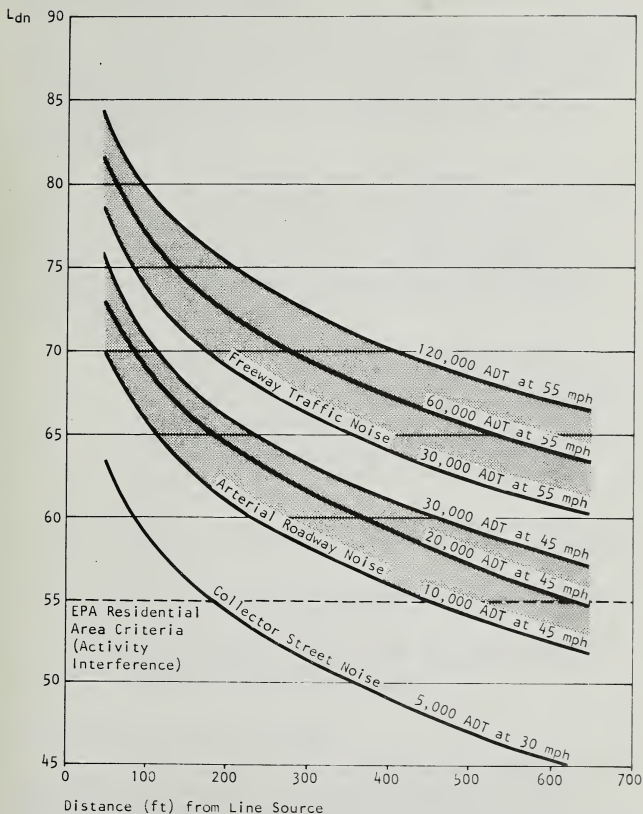


Figure 6.6-1
COMPARISON OF ROADWAY NOISE LEVELS

Source: De Leuw, Cather & Company, based on National Cooperative Highway Research Report No. 117, U.S. EPA Publications.

5.0 SPECIAL ANALYSIS OF IMPACTS

In Chapter 4 of this report, the consultants, DeLeuw Cather & Company, have made an assessment of the environmental effects of the Proposed Action. In this chapter, the District staff summarizes the environmental effects with particular reference to certain specific considerations of significance and mitigation described in Section 15143, Subsections (a), (b), (c), (e), (f) and (g) of the State EIR Guidelines (Reference 19).

The Initial Environmental Study of Proposed Toll and Fare Increases is attached to this report. Table 4 (pages 16 and 17) of this Initial Study presents a summary of potential environmental effects. Item 21 of the table shows that the Proposed Action has no potential to produce environmental effects in the four specific categories designated in the State EIR Guidelines as requiring mandatory findings of significance. The assessment of environmental effects presented in Chapter 4 confirms this conclusion. Specifically, the Proposed Action would not:

- (1) Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare and endangered plant or animal or eliminate important examples of the major periods of California history or pre-history (see Section 5.1 below);
- (2) Have the potential to achieve short-term, to the disadvantage of long-term, environmental goals (see Section 5.4 below);
- (3) Have impacts which are individually limited but cumulatively considerable (see Section 5.4 below); and
- (4) Have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly (see Section 5.1 below).

5.1 Significant Environmental Effects

In their assessment of environmental effects (Chapter 4) the consultants indicate the need to distinguish between the immediate effects and the longer-term environmental considerations associated with the Proposed Action. The immediate effects would be caused by the change from the financial conditions of the last few years, in which the District has used its Available Reserves to subsidize the operations of its transit services at existing tolls and fares to the financial conditions of the Proposed Action, in which additional revenues would be raised to permit continued operation of the transit services. (For

discussion of these financial conditions see Appendix A). The consultant identifies the extrapolation of the conditions of the last few years as "baseline" conditions, and recognizes that, given the pending exhaustion of the District's Available Reserves, they do not represent an alternative course of action for the District. The baseline conditions are hypothetical and are used as a basis for comparison and assessment of the extent of the immediate effects. The longer-term environmental considerations relate the Proposed Action to other alternative courses of action (see Chapter 6, "Alternatives to the Proposed Action"), in which the "no project" alternative (Reference: State EIR Guidelines Section 15143(d)) is a generally conceived situation in which the minimal transit service cuts would be progressively introduced as an alternative to toll and fare increases.

It is relevant to note that while the "longer-term considerations" relate directly to the financial decisions now facing the District, the "immediate effects" do not, for the "immediate effects" compare the conditions under the Proposed Action with conditions that can no longer be perpetuated. The "immediate effects", however, are part of the total consideration of environmental impacts. They may be considered to relate, in retrospect, to the earlier decision to subsidize operating deficits from a finite reserve.

The consultants indicate that all environmental effects with a potential for significance relate to the "immediate effects" of the Proposed Action. There is no potential for significant effects related to the longer-term considerations because for all types of environmental effects the consequences of major reductions in transit services would be more severe than the consequences of the proposed toll and fare increases.

There are two ways in which the "immediate effects" of the Proposed Action might have the potential to create a significant environmental effect. First is the potential for increased traffic congestion, pollution, fuel consumption and noise resulting from changes in travel patterns. Second is the potential for inequity or human hardship resulting from the increased costs of travel.

5.1.1 Traffic-Related Effects

The consultant found no potential for significant noise impacts. Air quality and fuel consumption aspects were seen to have potential for significance only in the regional context. They relate, therefore, to the probable change in total daily vehicle miles traveled (VMT). The consultant weighed all possible sources of change, noting that a probable minor, general movement of travelers from transit to auto would be offset, in whole or in part, by a minor discouragement to auto travel, a further minor encouragement of carpooling, and reduced delay at the toll gate resulting from faster processing of the \$1.00 toll or convenience tickets. The assessment emphasized identification of worse case situations, but showed that none of the six Alternative Proposals of the Proposed Action would produce significant effects on air quality or energy consumption. Congestion would be reduced or changed insignificantly with the exception that under Alternative 1 (involving 20% discount on convenience books for tolls), commute period congestion would increase. When assessed

over all congested sections of the U.S. 101 Corridor, additional delay per vehicle at the height of the traffic peak could amount to 3 minutes southbound and 6 minutes northbound.

5.1.2 Human Hardship

The consultant examined available knowledge and statistics to determine if the proposed toll and fare increases have the potential to place an inequitable burden upon, or create human hardship or inconvenience for, any particular social group as defined by place of residence, place of work, income, race, sex, age or automobile possession.

Such analysis, by its nature, is uncertain and inexact, and it is not possible to establish that a significant impact would or would not result. The review, however, implies that significant effects are probable in that:

- (1) The proposed discounts on convenience books would serve to benefit higher-income travelers, as a group, more than low-income travelers and are, therefore, regressive; and
- (2) The coincidence of a relatively large low-income, transit-dependent population in Sonoma County, and the relatively larger increases for Sonoma County-based transit fares, creates a potential for some limited inconvenience and reduced expectation of mobility for some Sonoma County residents.

5.2 Significant Unavoidable Effects

Each of the significant or probable significant effects identified in Section 5.1 above could be substantially reduced or avoided by selection of an appropriate Alternative Proposal or by adoption of other mitigating measures, both of which courses are discussed in Section 5.3 below.

5.3 Mitigation Measures

Mitigation measures that are pertinent to the principal areas of potential environmental effect are discussed in Chapter 4, Subsections 4.1.4, 4.2.5, 4.4.7 and 4.4.3. Each of the significant or probable significant effects identified in Section 5.1 above could be substantially reduced or avoided by selection of an appropriate Alternative Proposal or by adoption of other mitigation measures. The adoption of such actions must be weighed against other needs and policies, some of which are beyond the scope of this report. The identification of such action, therefore, is undertaken to complete the process of environmental reporting, and does not constitute a recommendation by any of the contributors to this report.

It is relevant to note that each of the effects is in the category of "immediate effects" and none are in the category of "long-term" considerations as defined in Section 5.1.

5.3.1 Mitigation of Increased Peak Congestion

- (1) Since a significant increase in commute period congestion is identified only with Alternative Proposals 1, 3 and 4, the effect can be avoided by selection of one of the Alternative Proposals 2, 5 or 6.
- (2) If Alternatives 1, 3 or 4 were adopted, measures to mitigate the resulting increase in peak congestion could include actions to further encourage carpooling, vanpooling and staggered work hours, and additional bus priority measures to make bus travel more attractive in comparison with private autos.

5.3.2 Mitigation of Probable Inequity of Discounts

The objective of the proposed discounts on convenience books is to alleviate the financial burden of the increases on the most frequent users of the bridge and the transit services (see Section 2.4.8).

- (1) The probable social inequity that the proposed discounts on convenience books are likely to benefit higher-income travelers, as a group, more than lower-income travelers (see Section 5.1.2(1)) could be eliminated by eliminating the discount provision from the Proposed Action.
- (2) If the discount provision were to be retained, its probable impact could be mitigated by committing its introduction for a trial period only, pending a survey of user incomes and frequency of use, and a more detailed study of the question of equity.

5.3.3 Mitigation of Probable Disturbance to Certain Sonoma County Residents

The objective of the larger increases for fares to and from Sonoma County is to make fares more accurately reflect the additional operating costs associated with trip length (see Section 2.4.6). The probable inconvenience and reduced expectation of mobility that may be felt by some low-income, transit-dependent residents of Sonoma County in adjusting to the increases could be mitigated by applying these increases progressively over a period of time.

5.4 Local Short-Term Uses of the Environment vs. Maintenance and Enhancement of Long-Term Productivity

The potential environmental effects of the Proposed Action are assessed in Chapter 4. None of these potential and insignificant effects,

when combined with other environmental effects could produce a cumulative and significant effect.

The Proposed Action is an individual action and is not part of a series or sequence of actions which would in combination have a significant environmental effect. While it is probable that continued inflation, or the need for expanded transit services, or the need to adjust a component of the transit system to make its revenues more accurately reflect its costs, could lead the District at some future date to consider a further increase in tolls or fares, such consideration would be based upon the need, policies and environmental considerations at that time. The Proposed Action would not constitute a precedent having a dominating influence over the considerations at that future time.

The six Alternative Proposals that constitute the Proposed Action are described in Table 2-3. They and the components by which they are distinguished are described in Section 2-4. Alternatives to the Proposed Action are reviewed in Chapter 6. The objective of the Proposed Action is to raise additional revenues to permit the continued operation of the District's transit services in accordance with its policies, plans and commitments, and is described in Section 2.3.

In this context, the maintenance and enhancement of long-term productivity of the environment requires the continued operation and, if necessary, the expansion of the District's transit services. The transit services provide a high-efficiency alternative to the use of the private automobile in a high-volume transportation corridor, reducing the consumption of fuel, the atmospheric emissions and the amount of land associated with the corridor's operation. In addition, the existence of the transit services as a viable alternative creates the social and legal conditions in which it is feasible to take actions to discipline the social use of the automobile. Such actions include the voluntary abstention from driving by persons with a physical incapacity with withdrawal of licenses by the courts and the implementation of restrictions on automobile access to environmentally sensitive areas. The continued use and emphasis on public transit permits and encourages development of the "community center" concept of land use in contrast to urban sprawl. This concept is fundamental to the long-range planning goals of the regional and local planning authorities. Transit fulfills a social need, significantly enhancing the personal mobility of a substantial portion of the population.

Alternatives 5 and 6 provide an opportunity for a significant reduction in corridor congestion, emissions and fuel consumption and additional revenues for the expansion of transit by charging higher tolls for single-occupant automobiles. These alternatives adopted either now or at some later date would serve to enhance the long-term productivity of the environment.

5.5 Irreversible Environmental Changes

Since the Proposed Action would not involve or directly lead to construction or physical change to any specific facility, its potential

for causing irreversible environmental changes is limited to its effects on land use patterns and growth, and on motor fuel consumption. These effects are reviewed by the consultants in Chapter 4, Section 4.3 and 4.5, respectively. Neither are considered significant.

5.6 Growth Inducement

In Section 4.3, the consultants have reviewed the probable effects of the Proposed Action on land use patterns and growth inducement. By permitting the continued operation of transit services, the Proposed Action will assist in the channelization of growth and encouragement of land use patterns that are the goal of regional and local planning agencies. The increase in transportation costs; that is, the immediate effect of the Proposed Action would have certain expected general influences on growth and land use patterns, but it is concluded that these influences would be insignificant.

6.0 ALTERNATIVES

As stated in Section 2.3, the objective of the Proposed Action is to raise additional revenues which are needed to continue full operation of the District's transit services. A systematic examination of the scope for all possible alternatives to the Proposed Action identifies two primary categories of alternatives:

- (1) Actions to raise the needed revenue in some alternative manner, and
- (2) Actions that would avoid the need for the additional revenues.

In the summer of 1975, and again in 1976, the District's Board of Directors considered the fact that transit operating deficits were rapidly consuming the available reserves and proposed toll and fare increases that would raise sufficient additional revenues to balance the operating budget. The district held public hearings on the proposal in San Francisco, San Rafael and Santa Rosa, and the proposal received wide comment in local media. The District addressed the alternatives in terms of its policies and commitments (see Section 2.3). In addition to inviting general comment, it invited specific comment on alternative means of raising the additional revenues, including:

- (1) Higher tolls for single-occupant automobiles during the commute period;
- (2) The sale of "convenience books" containing tickets for the payment of bridge tolls or transit fares, at a discount below the full cost of the tolls or fares;
- (3) The relative amounts of the toll increase and fare increase; and
- (4) The relative amount of the fare increase to be applied to long-distance and short-distance transit trips.

The District also invited comment on alternatives that would reduce the financial burden of the increases for some bridge and transit users, and could in the long-term lessen the need for additional revenues. These included:

- (1) Commuter carpool and vanpool program; and
- (2) The exploitation of secondary revenue opportunities such as the selling of advertising space on buses.

Public reaction to these alternatives was mixed, though there was predominant opposition to the introduction of higher tolls for single-occupant commuters; this alternative being considered discriminatory against persons who had no choice but to drive along during commute hours. There was also predominant opposition to placing advertisements on District buses.

In addition to consideration of the above alternatives, there were many specific requests for additional transit services, and there was extensive opposition to the proposed increases based on other considerations. These considerations are relevant to the extent that they may broaden the present review of alternatives.

Very briefly, this public and media comment expressed unwillingness to approve the proposed increases, as this would endorse certain allegedly unsatisfactory and potentially unsatisfactory aspects of the District's activities. These allegations included:

- (1) Inadequate representation of the interest of commuters in the composition of the District's Board of Directors;
- (2) The potential for excessive costs and inadequate patronage on the ferry system; and
- (3) Insufficiency economy in the District's operations, particularly in the area of labor costs.

In particular, the Marin County Commuters Association advocated immediate liquidation of the uncompleted ferry system. At a later date, the Marin County Transit District, after consideration of the Marin County Commuters Association's recommendation, passed a resolution advocating review of the economics of the ferry system after a trial period and recommended a formula for action in the event that the economics proved unsatisfactory.

In the two years that have followed the first proposal of the toll and fare increases, action has been taken on all of the above-listed allegations:

- (1) By action of the State Legislature, Marin County now appoints a fourth member to the District's Board of Directors. In making this appointment, Marin County has chosen the nominee of the Marin County Commuters Association;
- (2) The new Larkspur to San Francisco ferry service has begun operation. During its initial operations, it has demonstrated a high level of technical reliability and passenger appeal, and costs in line with recent projections; and
- (3) The District has pursued a policy of stringent economies in all aspects of its activities, including labor costs.

In addition, the District has obtained federal funds to operate a vanpool demonstration project, and joint action by the District and CALTRANS has provided use of the high-occupancy freeway lanes and toll-free passage at the Golden Gate Bridge to commuter carpools.

6.1 The Alternative Proposals

Section 2.4 describes six Alternative Proposals that have been identified by the Board of Directors for detailed analysis, with prime focus on Alternatives 1 and 2. The six Alternative Proposals cover the range of alternatives considered by the Board to be most suitable. Their environmental effects are assessed in Chapters 4 and 5 and compared with the alternative of successively reducing transit services to avoid increasing tolls or fares.

Before identifying the six Alternative Proposals the Board considered a variety of other alternatives.

6.2 Other Means of Increasing Revenues

It is possible that the District could raise additional revenue by increasing the tolls for vehicles other than automobiles (for the schedule of tolls see Table 2-1) or by further increasing the toll on private automobiles, and could thus avoid the need for an increase in transit fares. Such measures are not considered desirable because:

- (1) The District has a policy that its transit services should cover at least 50% of their cost from farebox revenues (see Section 2.3);
- (2) Due to the fact that many users of the Golden Gate Bridge are not beneficiaries of the transit subsidies, considerations of equity and justice place a limit on the extent to which tolls may be increased to provide transit subsidy; and
- (3) Public transit is substantially an alternative to automobile travel, but is in no way an alternative to freight and general commercial traffic. The justification for raising tolls on non-automobile traffic to subsidize transit is, therefore, less clear.

In pursuing its mission to provide high-quality public transit services, the District has from the beginning chosen not to sell advertising space on its transit vehicles. Other opportunities for secondary revenues, such as commissions from snack bars and sale of Golden Gate Bridge souvenirs, are exploited as far as possible.

The sources of federal, state and other transit subsidies are identified in Section 3.5 of this report. The District will continue to obtain all such subsidies that can be made available to support its transit services. The Five-Year Financial Projections, described in Appendix A, account for the District's full expectation of such subsidies.

There is no hope that monies obtainable through further exploitation of secondary revenue sources, or through additional outside

subsidies, could significantly change the District's need for additional revenues.

6.3 Reducing Expenditures as an Alternative

6.3.1 Operating Economies

The severe inflation of recent years has caused the District's operating costs to increase in step with the costs of the transit industry nationwide. In particular, the recent tripling of the price of commercially-bid diesel fuel and the labor-intensive nature of the transit industry have contributed to inflation. The district's expectations of inflation during the next five years are reviewed in Appendix D.

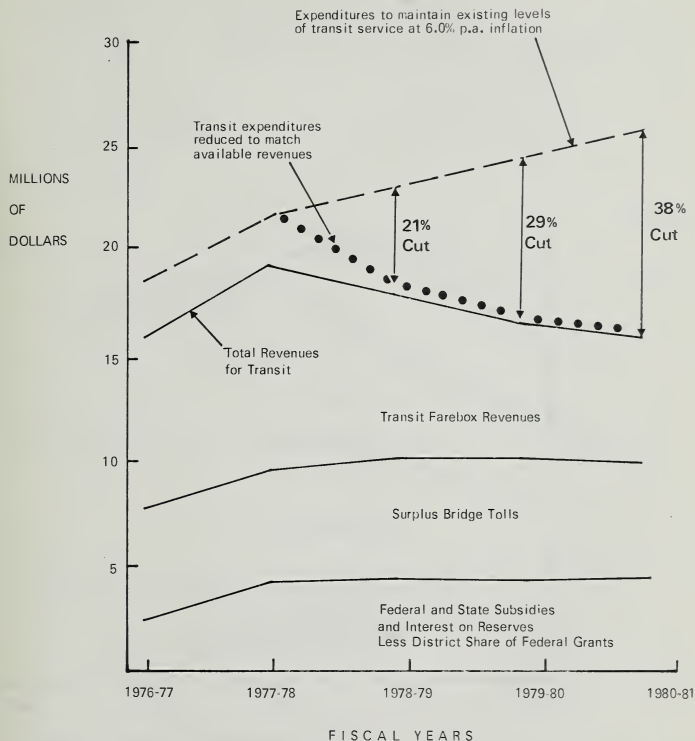
The District will continue to make every effort to hold down costs and to maintain or improve the productivity of its operations, but there is no hope that efficiency improvements alone could significantly reduce the need for additional revenues.

6.3.2 Curtailment of Transit Services

The only means by which the District could reduce its operating costs by an amount sufficient to avoid the need for additional revenues is through reduction of its transit services.

The District's Five-Year Financial Projections are discussed in Appendix A. They show that total revenues available to support transit operations are the sum of farebox revenues from the bus and ferry operations, bridge toll revenues that are surplus to the needs of operating, maintaining and repairing the Golden Gate Bridge, federal and state operating subsidies, and interest on invested reserves.

The projections assume a continuation of the growth in traffic on the Golden Gate Bridge at approximately 2.1% per annum and a somewhat higher growth in demand for transit services. The projections must also allow for continued inflation in the District's costs of operation. Inflation is at the root of the District's financial problem and the projected financial picture varies drastically depending upon the rate of inflation that is assumed. The factors affecting the District's anticipation of inflation are discussed in Appendix D. Figure 6.1 illustrates the District's Financial Projections, assuming an inflation rate of 6.0%. Figures 6.2 and 6.3 adapt these projections to accommodate hypothetical inflation rates of 0% and 10% per annum. In these figures, the discrepancy between expenditures and revenues is assumed to be met from available reserves, until the reserves are exhausted. Thereafter, transit services are assumed to be cut until transit expenditures are reduced to the level of total transit revenues. As any reduction in transit service must cause a reduction in transit farebox revenues, the "Farebox Revenues" component of total revenues is reduced in the same proportion as the reduction in Transit Expenditures.

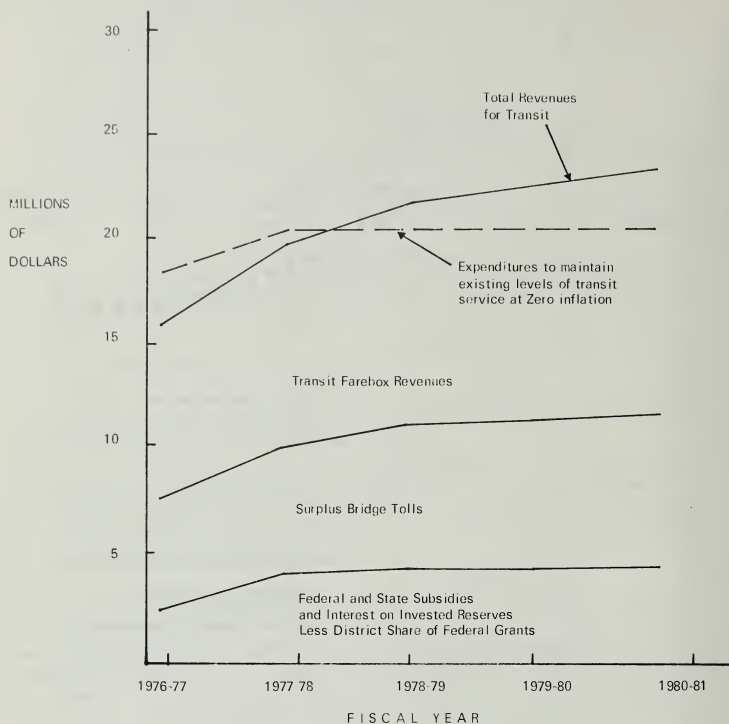


Source: District five year Financial Projections

Note: Available Reserves exhausted in 1977-78 requiring transit expenditures to be reduced to match available revenues.

FIGURE 6.1

TRANSIT SYSTEM REVENUES AND EXPENDITURES WITH EXISTING TOLLS AND FARES AND 6.0% P.A. INFLATION



Source: District five year Financial Projections

Notes: Available Reserves used to subsidize transit in FY 1976-77 and FY 1977-78. Thereafter transit will return a surplus to Reserves until transit services are expanded.

FIGURE 6.2

TRANSIT REVENUES AND EXPENDITURES WITH EXISTING
TOLLS AND FARES AND ZERO INFLATION

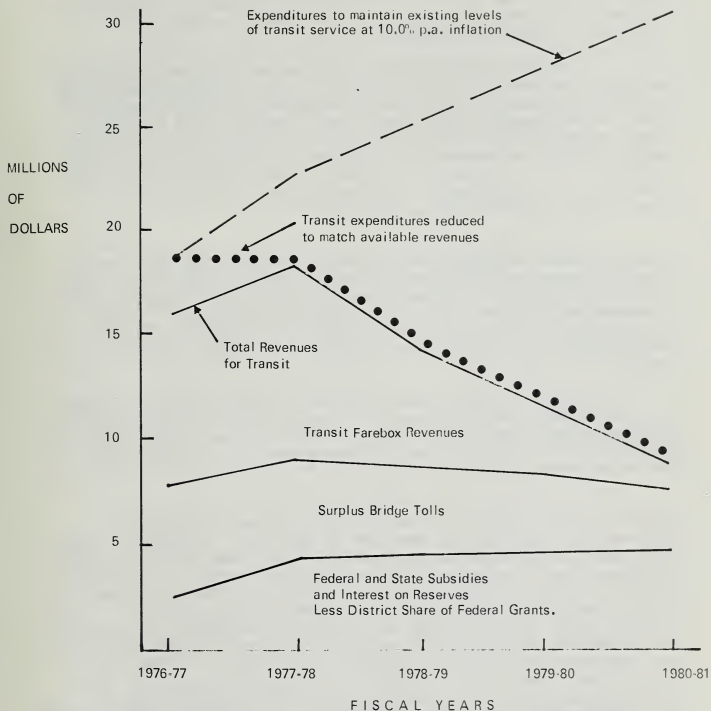


FIGURE 6.3

TRANSIT REVENUES AND EXPENDITURES WITH EXISTING TOLLS
AND FARES AND 10.0% INFLATION

The three figures provide a preliminary indication of the degree to which transit service cuts would be necessary if the District received no increase in revenues but sustained the assumed rates of inflation in its operating costs.

With zero inflation rate, the expected growth in Bridge traffic would yield a steadily increasing surplus from Bridge tolls and growth in transit patronage would produce steady growth in transit revenues. Thus, transit revenues would grow and by FY 1978/79 would cover all operating expenditures. Reserves would be consumed during FY 1976/77 and FY 1977/78, but would not be exhausted. This relationship assumes that there is no increase in the extent of transit services, and that growth in transit patronage is accommodated by increased load factors on the ferries and on some bus schedules.

With a 6.0% per annum inflation rate in bridge and transit operating costs, the surplus from bridge tolls would not grow. Though transit revenues would grow reflecting the growth in transit patronage, total revenues would lag expenditures and the available reserves would be exhausted by July 1, 1978. Then, to balance the budget, transit services would have to be cut in FY 1978/79, FY 1979/80 and FY 1980/81 so that they would be respectively 21%, 29% and 38% below the existing levels.

With a 10.0% per annum inflation rate the surplus from bridge tolls would decrease in each successive year, available reserves would be exhausted and major transit service reductions would be put into effect during FY 1977/78. Transit services would be reduced to some 30% of their present levels by 1981.

This illustration of the general extent of reductions in transit services is the most precise that could be meaningful without reference to a specific plan for service reductions. Between 1971 and 1975, the District acted upon the instructions of the California State Legislature and, in cooperation with other regional and local agencies, private citizens and organized groups, developed its Transportation Facilities Plan (Reference 2). The Plan describes the District's policies, plans and commitments for meeting the transportation needs of the Golden Gate Corridor. This project cost the participating federal and local agencies together in excess of half a million dollars. A plan for major reductions in transit services would necessarily supersede this Plan, and revise the District's policies and commitments. Its development would be of comparable complexity, requiring the participation of other agencies, considerable time and expenditure of public money.

This analysis shows that, in the absence of additional revenues, the District must anticipate large reductions in transit services and the policy choosing these reductions would violate the District's carefully established policies, plans and commitments. Consequently, actions involving the reduction of transit services have not been considered for more detailed analysis.

AUTHORS AND PERSONS CONTACTED

On April 7, 1977, the Finance-Auditing Committee of the Board of Directors of the Golden Gate Bridge, Highway and Transportation District considered the staff report, "Initial Environmental Study of Proposed Toll and Fare Increases", and concluded that a Draft Environmental Impact Report (DEIR) should be prepared. On April 8, 1977, the Board of Directors considered the Initial Environmental Study and the recommendation of the Finance-Auditing Committee, and passed Resolutions Nos. 9330 and 9331, instructing staff to prepare a Draft Environmental Impact Report, stipulating the alternative proposals to be analyzed.

The Initial Environmental Study is attached in its entirety to this report.

Work proceeded under the direction of Dale W. Luehring, General Manager, and under the direct supervision of Jerome M. Kuykendall, Assistant to the General Manager for Planning and Research. Candice A. Adcock, Secretary to Mr. Kuykendall, typed and proofread the document. Peter Dyson, Senior Planner, coordinated the work and prepared Chapters 1, 2, 5 and 6. Alan R. Zahradnik, Assistant under MTC's Technical Assistance Program, prepared Chapter 3 and Appendix C. Tim R. Youmans, Assistant Planner, with guidance from Robert D. Tough, Auditor-Controller and John J. Quigley, Deputy Auditor-Controller, prepared Appendix A; and with guidance from Angus M. McDonald, President of McDonald & Grefe, Inc., prepared Appendix B. The consulting firm of McDonald & Grefe, Inc., had made simulation runs using the District's Pricing Model, and provided other assistance during the Initial Study phase. Their work is identified in the section, "Authors and Persons Contacted," of the Initial Study.

The consulting firm of DeLeuw Cather & Company of San Francisco prepared Chapter 4, "Assessment of Environmental Effects." Walter Kudlick, Vice President, held corporate responsibility for the work. Paul Holley, Principal Urban Planner, managed the assessment, was principal author of the chapter, and rendered extensive general advice to District staff. Mr. Holley was assisted by Lisa Trygg, Senior Environmental Planner. The consultants examined the District's statistics and other data and stipulated the particular data to be provided to them for use in the assessment. This data is assembled in Appendices A, B and C.

Dr. Robert S. Nielsen, Vice President and Chief Economist of DeLeuw Cather & Company, after a review of the District's financial statements, prepared Appendix D, "Prospects for Continued Inflation FY 1976/77 thru FY 1980/81."

Vince Petrites and Pat Hackett of the Metropolitan Transportation Commission provided information for inclusion in Chapter 3. Bob Chioino of CALTRANS ran the EMFAC III model and provided other assistance in preparation of Appendix C.

Ray McDevitt, attorney with Hanson, Bridgett, Marcus, Milne & Vlahos, of San Francisco, provided guidance on the form and content of the report.

This report was also reviewed by the following senior staff of the District:

David J. Miller, Attorney
Robert D. Tough, Auditor-Controller
H. D. Reilich, District Engineer
H. Donald White, Manager, Bus Transit Division
Stanley M. Kowleski, Manager, Ferry Transit Division
Robert A. Warren, Manager, Bridge Division

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19. "Summary - Community Development Element of the Sonoma County General Plan", Sonoma County Planning Department (November 1975)
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21. "Guidelines for Implementation of the California Environmental Quality Act of 1970", Title 14, Natural Resources, Division 6, Resources Agency (October 9, 1976)
22. "Transportation Resources Management and Multi-Modal Pricing Policy", Draft Final Report, McDonald & Smart, Inc. (April 1975)

ENVIRONMENTAL IMPACT REPORT
PROPOSED TOLL AND FARE INCREASES

APPENDIX A
DISTRICT FINANCIAL PROJECTIONS

TO: Dale W. Luehring, General Manager
FROM: R. D. Tough, Auditor-Controller
DATE: June 1, 1977
SUBJECT: DISTRICT FINANCIAL PROJECTIONS

The attached information documents the District's financial situation as it has been presented to the Board in our Five-Year Financial Projections.

Section IV of the attachment was prepared by the District Planning staff. Based on the Five-Year Projections at current levels of tolls and fares, it estimates the probable extent of transit service reductions.

The following subject areas are included:

- I. Purpose
- II. Five-Year Projections
- III. District Reserve Expenditures
- IV. Projections of Transit Service Reductions

I. PURPOSE

At the Board of Directors meeting of October 29, 1976, the Board passed Resolution No. 9147 authorizing District staff to prepare supporting data for preliminary analysis of the toll and fare increases based on the Five-Year Financial Projections as submitted by the Auditor-Controller and General Manager.

The purpose of this appendix is to present the Five-Year Projections of the District's financial position and other supporting information used in the environmental assessment of the toll and fare increases as presented in the Environmental Impact Report.

II. FIVE-YEAR PROJECTIONS

The Auditor-Controller of the District presented to the Finance-Auditing Committee at its meeting on October 28, 1976, the Five-Year Financial Projections shown in Table I and Table II.

In Table I the Five-Year Projection is stopped after FY 1977/78. At that point, with the present toll and fare structure, available District reserves to support transit deficits and other District financial needs are nearly exhausted.

Earlier financial projections than those shown in the tables of the \$.25 toll increase and a transit fare increase indicated that between \$4 and \$5 million in additional annual revenue could be generated.

Table II shows the Five-Year Projection of the District's financial condition with additional revenues generated by a toll and fare increase effective July 1, 1977. The projection of increased revenues is based on a \$1.00 bridge toll with 20% discount and a \$2.25 maximum fare from Santa Rosa to San Francisco with a 20% discount provision. New Five-Year Projections are currently being prepared by the Auditor-Controller's office, but were not available in time for inclusion in this appendix. However, it is not expected that the District's financial condition will change substantially. This was stated by the District General Manager in his memorandum to the Finance-Auditing Committee on March 29, 1977 concerning environmental considerations of the toll/fare increases.

Table III shows the assumptions used in developing the Five-Year Projections.

III. DISTRICT RESERVE EXPENDITURES

IN 1969, the California State Legislature authorized (A.B. 584) the District to use its financial reserves and surplus toll revenues to provide public transportation between San Francisco and Marin and Sonoma Counties.

TABLE I

GOLDEN GATE BRIDGE, HIGHWAY AND TRANSPORTATION DISTRICT
FIVE-YEAR PROJECTION

	(Includes No Toll or Fare Increase) (6% Inflation Rate)	
	FY 1976/77	FY 1977/78
BALANCE DISTRICT RESERVES	<u>\$14,443,100</u>	<u>\$11,701,800</u>
LESS: RESTRICTED RESERVES		
Bridge Deck Repairs	500,000	1,000,000
Replacement of Buses and Ferries	1,995,400	2,500,400
Dredging Larkspur Channel	187,500	312,500
Minimum Reserve	<u>5,000,000</u>	<u>5,000,000</u>
TOTAL RESTRICTED RESERVES	<u>7,682,900</u>	<u>8,812,900</u>
AVAILABLE DISTRICT RESERVES	<u>6,760,200</u>	<u>2,888,900</u>
BRIDGE OPERATIONS	7,457,000	7,143,400
BRIDGE MAJOR REPAIRS & CAPITAL	<u>(1,419,000)</u>	<u>(1,152,000)</u>
BUS OPERATIONS	(4,770,300)	(4,803,300)
BUS CAPITAL	<u>(21,500)</u>	<u>(50,000)</u>
FERRY OPERATIONS	(2,123,600)	(3,084,900)
FERRY CAPITAL	<u>(163,000)</u>	<u>(50,000)</u>
DISTRICT SHARE OF FEDERAL GRANTS	(1,700,900)	(407,400)
ENDING AVAILABLE DISTRICT RESERVES	<u>\$4,018,900</u>	<u>\$ 484,700</u>

TABLE II

GOLDEN GATE BRIDGE, HIGHWAY AND TRANSPORTATION DISTRICT
FIVE-YEAR PROJECTION

(Includes Toll/Fare Increase 7-1-77 - 20% Discount)
(6% Inflation Rate)

	<u>FY 1976-1977</u>	<u>FY 1977-1978</u>	<u>FY 1978-1979</u>	<u>FY 1979-1980</u>	<u>FY 1980-1981</u>
BEGINNING BALANCE DISTRICT RESERVES	<u>\$14,433,100</u>	<u>\$11,701,800</u>	<u>\$13,217,400</u>	<u>\$15,169,000</u>	<u>\$16,174,100</u>
LESS: RESTRICTED RESERVES					
Bridge Deck Repairs	500,000	1,000,000	1,500,000	2,000,000	2,500,000
Replacement of Buses and Ferries	1,995,400	2,500,400	3,005,400	3,510,400	4,015,400
Dredging Larkspur Channel	187,500	312,500	437,500	562,500	687,500
Minimum Reserve	<u>5,000,000</u>	<u>5,000,000</u>	<u>5,000,000</u>	<u>5,000,000</u>	<u>5,000,000</u>
TOTAL RESTRICTED RESERVES	<u>7,682,900</u>	<u>8,812,900</u>	<u>9,942,900</u>	<u>11,072,900</u>	<u>12,202,900</u>
<u>AVAILABLE DISTRICT RESERVES</u>	<u>6,750,200</u>	<u>2,888,900</u>	<u>3,274,500</u>	<u>4,096,100</u>	<u>3,971,200</u>
BRIDGE OPERATIONS	7,457,000	7,143,400	6,845,800	6,525,800	6,199,100
BRIDGE MAJOR REPAIRS & CAPITAL	(1,419,000)	(1,152,000)	(580,000)	(736,700)	(816,500)
BUS OPERATIONS	(4,770,300)	(4,803,300)	(5,210,400)	(5,706,400)	(6,250,600)
BUS CAPITAL	(21,500)	(50,000)	(50,000)	(50,000)	(50,000)
FERRY OPERATIONS	(2,123,600)	(3,084,900)	(2,098,500)	(3,247,300)	(3,465,900)
FERRY CAPITAL	(163,000)	(50,000)	(50,000)	(50,000)	(50,000)
DISTRICT SHARE OF FEDERAL GRANTS	(1,700,900)	(407,400)			
ENDING AVAILABLE DISTRICT RESERVES	<u>\$4,018,900</u>	<u>\$ 484,700</u>	<u>\$1,131,400</u>	<u>\$ 831,500</u>	<u>\$ (462,700)</u>
TOLL/FARE INCREASE EFFECTIVE 7-1-77		<u>3,919,800</u>	<u>4,094,700</u>	<u>4,269,700</u>	<u>4,444,700</u>
ENDING AVAILABLE DISTRICT RESERVES		<u>\$4,404,500</u>	<u>\$5,226,100</u>	<u>\$5,101,200</u>	<u>\$3,982,000</u>

TABLE III
FIVE-YEAR PROJECTION ASSUMPTIONS

1. Budgets for Fiscal Year 1976/77 serve as the basis for the four additional projected years.
2. The present toll structure is maintained during the five-year period.
3. Bridge vehicular traffic is projected to increase 2% per year over the next four years.
4. Bridge, bus and ferry transit expenses are increased 6% per year.
5. The District share of federal capital grants is included over the five-year period.
6. State Transportation Development Act funds and Federal Operating Assistance funds have been included over the five-year period.

As of the retirement of the last of the bridge construction bonds on July 1, 1971, the District has a total reserve of \$22.8 million.

Table IV shows the use of District reserves to match federal grants to pay for major bridge repairs and maintenance, and to provide operating subsidies for the bus and ferry public transit systems.

As shown in the projections, by the end of Fiscal Year 1976/77, uncommitted District reserves will be below \$5 million. By the end of Fiscal Year 1977/78, the uncommitted District reserves available to support transit operating deficits will be nearly exhausted.

A summary of the capital grants authorized by the Urban Mass Transportation Administration (UMTA) to the District for the purchase of the bus and ferry transit systems is shown in Table V. The local share of matching funds required in the capital grant was paid out of the District reserves as noted in Table IV. The purchase of the transit system will be entirely paid for by the end of Fiscal Year 1977/78, with no outstanding debt.

IV. PROJECTIONS OF TRANSIT SERVICE REDUCTIONS

Assuming that no toll or fare increases were approved, the District would be forced to make cuts in transit services. The District planning staff has estimated the extent of the transit service reductions required to make District expenditures balance with available reserves and farebox revenues.

The projections of transit service cuts assume 2% growth in bridge traffic and revenues, approximately 5.5% growth in combined patronage and revenues for the bus and ferry systems, but no growth in bridge or transit expenditures other than inflation. In addition, it is assumed that there is no expansion of bus operations and all patronage growth prior to July 1, 1981 goes into improved load factors on ferries and buses.

Figure 1 shows the District revenue position with an assumption of zero inflation in bridge and transit expenditures. In this case, bridge operations show a small surplus which could be used to allow for expansion of transit services or repay some of the expended reserves.

Figure 2 shows the District financial position with a 6% inflation assumption for bridge and transit expenditures (21% cut in Fiscal Year 1977/78) required to match available revenues. The 6% inflation assumption is the most representative of the current inflation situation.

Figure 3 shows the District financial position with a 10% inflation assumption for bridge and transit expenditures. Reductions in transit service were so severe that no estimate of possible percentage decreases in service were developed.

Tables VI, VII and VIII present the supportive data used to develop Figures 1, 2 and 3, respectively.

TABLE IV

GOLDEN GATE BRIDGE, HIGHWAY AND TRANSPORTATION DISTRICT
DISTRICT RESERVE EXPENDITURES 1971-1978
(Millions of Dollars)

Fiscal Year	Beginning District Reserves		Bridge Operations	Bridge Major Repairs/Capital	District Subsidy Bus/Ferry	District Share Transit Capital Grants & Capital	Ending Available District Reserves	
	Total Restricted	Available						
	(1)							
1971-1972	22.8	7.5	15.3	5.0	(1.1)	(2.3)	(3.8)	13.1
1972-1973	20.6	7.5	13.1	4.9	(2.0)	(1.8)	(1.8)	12.4
1973-1974	19.9	8.2	11.7	6.2	(2.4)	(2.2)	(3.7)	9.6
1974-1975	17.8	6.1	11.7	8.1	(2.9)	(2.8)	(5.1)	9.0
1975-1976	15.1	6.5	8.6	7.4	(2.9)	(3.2)	(2.0)	7.9
1976-1977	14.4	7.7	6.7	7.5	(1.4)	(6.9)	(1.9)	4.0
1977-1978	11.7	8.8	2.9	7.1	(1.1)	(7.9)	(.5)	.5

SOURCE: District annual reports Fiscal Years 1972-1976
District Five-Year Financial Projection Fiscal Year 1977-1978

(1) The District by resolution has restricted reserves for such purposes:

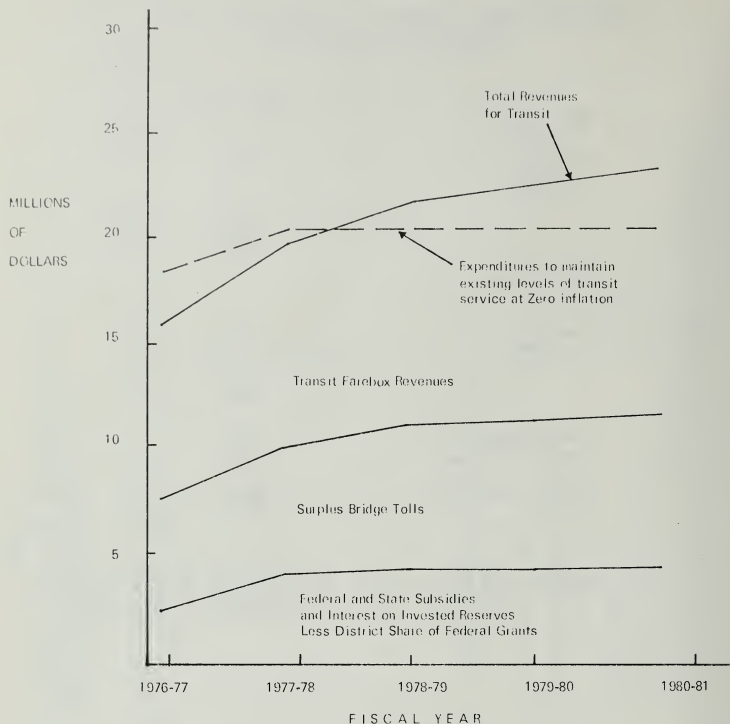
<u>Restricted Reserves June 30, 1977</u>
<u>(millions of dollars)</u>
Minimum Reserve
Bridge Deck Repairs
Maintenance Channel Dredging
Depreciation Reserves - Buses & Ferries
<u>\$5.0</u>
<u>.5</u>
<u>.2</u>
<u>2.0</u>
<u>\$7.7</u>

TABLE V

GOLDEN GATE BRIDGE, HIGHWAY AND TRANSPORTATION DISTRICT
FEDERAL CAPITAL GRANT SUMMARY
(Millions of Dollars)

<u>BUS PROJECT</u>	<u>TOTAL PROJECT</u>
Coaches	\$12.2
Terminals	6.2
Equipment	<u>1.7</u>
	<u>\$20.1</u>
 <u>FERRY PROJECT</u>	
Vessels	14.3
Terminals	23.5
Equipment	<u>.2</u>
	<u>\$38.0</u>
 Total Projects	58.1
Federal Grant Share	<u>41.6</u>
 District Local Share	<u>\$16.5</u>

SOURCE: UMTA Federal Capital Grant Budget No. 5 CA-03-0036
 UMTA Federal Capital Grant Budget No. 1 CA-03-0065

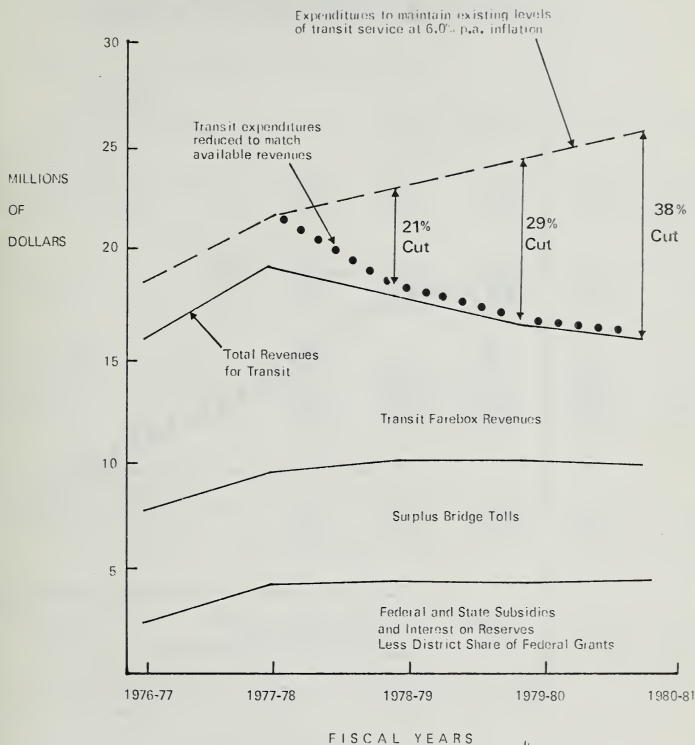


Source: District five year Financial Projections

Notes: Available Reserves used to subsidize transit in FY 1976-77 and FY 1977-78. Thereafter transit will return a surplus to Reserves until transit services are expanded.

FIGURE 1

TRANSIT REVENUES AND EXPENDITURES WITH EXISTING
TOLLS AND FARES AND ZERO INFLATION

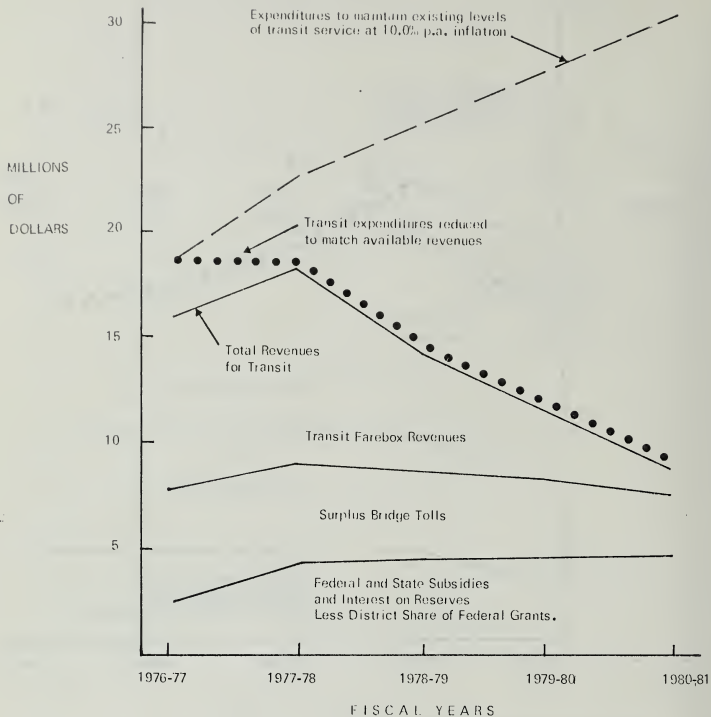


Source: District five year Financial Projections

Note: Available Reserves exhausted in 1977-78 requiring transit expenditures to be reduced to match available revenues.

FIGURE 2

TRANSIT SYSTEM REVENUES AND EXPENDITURES WITH EXISTING TOLLS AND FARES AND 6.0% P.A. INFLATION



Source: District five year Financial Projections.

Note: Available Reserves exhausted during FY 1977-78 requiring transit expenditures to be reduced to match available revenues.

FIGURE 3

TRANSIT REVENUES AND EXPENDITURES WITH EXISTING TOLLS AND FARES AND 10.0% INFLATION.

TABLE VI

REVENUE AND EXPENDITURE ANALYSIS
 ASSUMING CONTINUATION OF EXISTING TOLLS AND FARES
 (Inflation Rate Zero; Auto Traffic Growth 2.0% Per Annum)

	MILLIONS OF DOLLARS IN FISCAL YEARS:				
	1976/77	1977/78	1978/79	1970/80	1980/81
<u>RESERVES:</u>					
Beginning of Year Total Reserves	14.4	11.7	11.0	12.3	14.4
Less: Restricted Reserves	<u>(7.7)</u>	<u>(8.8)</u>	<u>(9.9)</u>	<u>(11.1)</u>	<u>(12.2)</u>
AVAILABLE RESERVES	6.7	2.9	1.1	1.2	2.2
<u>BRIDGE:</u>					
Revenues	13.3	13.6	13.8	14.1	14.4
Expenditures	<u>(7.9)</u>	<u>(7.6)</u>	<u>(7.0)</u>	<u>(7.1)</u>	<u>(7.1)</u>
SURPLUS	<u>5.3</u>	<u>6.0</u>	<u>6.8</u>	<u>7.0</u>	<u>7.3</u>
<u>TRANSIT:</u>					
Farebox Revenue	8.2	9.8	10.6	11.2	11.6
Federal & State Subsidies	<u>3.5</u>	<u>4.0</u>	<u>4.2</u>	<u>4.4</u>	<u>4.6</u>
Gross Revenues	11.7	13.8	14.8	15.6	16.2
Expenditures	<u>(18.6)</u>	<u>(20.6)</u>	<u>(20.6)</u>	<u>20.6</u>	<u>20.6</u>
DEFICIT	<u>(6.9)</u>	<u>(6.8)</u>	<u>(5.8)</u>	<u>(5.0)</u>	<u>(4.4)</u>
<u>OTHER:</u>					
Interest on Invested Reserves	0.7	0.5	0.3	0.1	0
District Matching Share to					
Federal Capital Grants	<u>(1.7)</u>	<u>(0.4)</u>	<u>0</u>	<u>0</u>	<u>0</u>
SUBTOTAL	<u>1.0</u>	<u>0.1</u>	<u>0.3</u>	<u>0.1</u>	<u>0</u>
 PAYMENTS FROM (INTO) THE RESERVES (i.e., Surplus + Deficit + Other)	 2.7	 0.7	 (1.3)	 (2.1)	 (2.9)

TABLE VII

REVENUE AND EXPENDITURE ANALYSIS
 ASSUMING CONTINUATION OF EXISTING TOLLS AND FARES
 (Inflation Rate 6.0% per annum; Auto Traffic Growth 2.0% per annum)

	MILLIONS OF DOLLARS IN FISCAL YEARS:				
	1976/77	1977/78	1978/79	1970/80	1980/81
RESERVES:					
Beginning of Year Total Reserves	14.4	11.7	9.3	9.9	11.1
Less: Restricted Reserves	<u>(7.7)</u>	<u>(8.8)</u>	<u>(9.9)</u>	<u>(11.1)</u>	<u>(12.2)</u>
AVAILABLE RESERVES	<u>6.7</u>	<u>2.9</u>	<u>(0.6)</u>	<u>(1.2)</u>	<u>(1.1)</u>
BRIDGE:					
Revenues	13.3	13.6	13.8	14.1	14.4
Expenditures	<u>(7.9)</u>	<u>(8.1)</u>	<u>(7.9)</u>	<u>(8.4)</u>	<u>(9.0)</u>
SURPLUS	<u>5.3</u>	<u>5.5</u>	<u>5.9</u>	<u>5.7</u>	<u>5.4</u>
TRANSIT:					
Farebox Revenue	8.2	9.8	8.3	8.2	7.1
Federal & State Subsidies	3.5	4.0	4.2	4.4	4.6
Gross Revenues	<u>11.7</u>	<u>13.8</u>	<u>12.5</u>	<u>12.6</u>	<u>11.7</u>
Expenditures	<u>(18.6)</u>	<u>(21.8)</u>	<u>(18.0)</u>	<u>(17.5)</u>	<u>(16.0)</u>
DEFICIT	<u>(6.9)</u>	<u>(8.0)</u>	<u>(5.5)</u>	<u>(5.9)</u>	<u>(4.3)</u>
OTHER:					
Interest on Invested Reserves	0.7	0.5	0.3	0.1	0
District Matching Share to					
Federal Capital Grants	<u>(1.7)</u>	<u>(0.4)</u>	<u>0</u>	<u>0</u>	<u>0</u>
SUBTOTAL	<u>(1.0)</u>	<u>0.1</u>	<u>0.3</u>	<u>0.1</u>	<u>0</u>
PAYMENTS FROM (INTO) THE RESERVES (i.e., Surplus + Deficit + Other)	2.7	2.4	(0.6)	(1.2)	(1.1)

TABLE VIII

REVENUE AND EXPENDITURE ANALYSIS
 ASSUMING CONTINUATION OF EXISTING TOLLS AND FARES
 (Inflation Rate 10.0% per annum; Auto Traffic Growth 2.0% per annum)

	MILLIONS OF DOLLARS IN FISCAL YEARS:				
	1976/77	1977/78	1978/79	1979/80	1980/81
<u>RESERVES:</u>					
Beginning of Year Total Reserves	14.4	11.7	9.3	9.9	11.1
Less: Restricted Reserves	<u>(7.7)</u>	<u>(8.8)</u>	<u>(9.9)</u>	<u>(11.1)</u>	<u>(12.2)</u>
AVAILABLE RESERVES	6.7	2.9	(0.6)	(1.2)	(1.1)
<u>BRIDGE:</u>					
Revenues	13.3	13.6	13.8	14.1	14.4
Expenditures	<u>7.9</u>	<u>(8.7)</u>	<u>(9.6)</u>	<u>(10.5)</u>	<u>(11.6)</u>
SURPLUS	<u>5.3</u>	<u>4.9</u>	<u>4.2</u>	<u>3.6</u>	<u>2.8</u>
<u>TRANSIT:</u>					
Farebox Revenue	8.2	9.1	5.4	3.4	1.3
Federal & State Subsidies	<u>3.5</u>	<u>4.0</u>	<u>4.2</u>	<u>4.4</u>	<u>4.6</u>
Gross Revenues	11.9	13.1	9.6	7.8	5.9
Expenditures	<u>(18.6)</u>	<u>(21.0)</u>	<u>(13.5)</u>	<u>(10.3)</u>	<u>(7.6)</u>
DEFICIT	<u>(6.9)</u>	<u>(7.9)</u>	<u>(3.9)</u>	<u>(2.5)</u>	<u>(1.7)</u>
<u>OTHER:</u>					
Interest on Invested Reserves	0.7	0.5	0.3	0.1	0
District Matching Share to					
Federal Capital Grants	<u>(1.7)</u>	<u>(0.4)</u>	<u>0</u>	<u>0</u>	<u>0</u>
SUBTOTAL	<u>(1.0)</u>	<u>0.1</u>	<u>0.3</u>	<u>0.1</u>	<u>0</u>
 PAYMENTS FROM (INTO) THE RESERVES (i.e., Surplus + Deficit + Other)	 2.7	 2.9	 (0.6)	 (1.2)	 (1.1)

ENVIRONMENTAL IMPACT REPORT
PROPOSED TOLL AND FARE INCREASES

APPENDIX B
EVALUATION OF TOLL AND FARE INCREASES USING
THE PRICING POLICY SIMULATION MODEL

The model is described more fully in "Transportation Resources Management and Multi-Modal Pricing Policy"--Draft Final Report and "User's Manual for the Pricing Policy Simulation Model", by McDonald & Grefe, Inc., April, 1975. Both documents are available at District Offices.

TO: Jerome M. Kuykendall

FROM: Tim Youmans

DATE: June 1, 1977

SUBJECT: EVALUATION OF TOLL AND FARE INCREASES USING
THE PRICING POLICY SIMULATION MODEL

This memorandum documents work with the District's Multi-Modal Pricing Model performed for the District by McDonald & Grefe, Inc., assisted by District planning staff. The Pricing Policy Simulation Model was used to simulate the impacts of the toll and fare alternatives proposed by the Board of Directors for evaluation during the preparation of the Environmental Impact Report.

The subjects discussed in this memorandum are:

I. Utilization of the Pricing Policy Simulation Model

- A. Purpose
- B. Alternatives
- C. Calibration
- D. Forecasting Assumptions
- E. Results

II. Model Description

- A. The Basic Structure of the Pricing Policy Simulation Model
- B. Assumptions and Limitations

I. UTILIZATION OF THE PRICING POLICY SIMULATION MODEL

A. Purpose. The purpose of the simulation effort was to produce five-year projections of the impact the toll and fare alternatives would have on vehicular traffic, transit patronage, and District revenue. For the purpose of comparison, it was assumed that a revised toll and fare policy would be implemented July 1, 1977.

The results of the simulation were used by District staff and the consultants performing the environmental impact analysis as part of the supportive data on which to base:

- (1) The environmental impacts of each policy based on the expected traffic changes in the Golden Gate Corridor; and
- (2) The impact of each policy on District revenues to meet District expenditure requirements.

In order to evaluate the District's policy options in meeting its revenue needs and traffic policy goals, the following criteria was applied to the pricing policy model results:

- (1) The relative impacts of fare and toll policies on District revenue, bridge vehicular traffic, and transit patronage for each alternative;
- (2) The potential revenue and patronage impacts measured against the established District policy goals of:
 - (a) Transit revenue and expenditure goal of 50% of transit expenditures paid out of the farebox;
 - (b) Peak period bridge traffic goal of no increase in vehicular traffic across the bridge in the peak period; and
 - (c) Transit patronage goal of 50% of transbay commuters carried by transit in the peak hour by 1980;
- (3) The impact of variable toll policies (placing a high toll on single-occupant vehicles and allowing free tolls for carpools) to determine what policies would promote the reduction of single-occupant vehicles for increased fuel efficiency and reduction of congestion. Single-occupant vehicles now represent 75% of bridge vehicular traffic in the peak period.

The consulting firm of McDonald & Greffe, Inc., provided computer services for the operation of the pricing model and technical assistance in analyzing the impact of the toll and fare policies. The pricing model is a computer simulation model that was developed for the GGBHTD in 1975 to test the financial consequences of changes in fares and service times by McDonald & Smart, Inc., in association with JHK &

Associates.¹

B. Alternatives. A total of 29 pricing model runs were completed to simulate the various toll and fare policies requested by the GGBHTD Board of Directors. The 29 simulations were used as a first pass analysis to determine the relative impacts of the policy alternatives. In several cases, more than one model run was required to test an alternative because of structural limitations in the pricing model to simulate circumstances such as changing occupancy rates caused by increased carpooling.

Six alternatives were selected for final detailed consideration in the Environmental Impact Analysis. Alternatives 1 and 2 are the two policy alternatives emphasized by the Board of Directors as the Proposed Action for Environmental Impact Analysis. Alternatives 3, 4, 5 and 6 represent alternatives to the Proposed Action. The six alternatives and the base case (current toll and fare policy) are identified in Table 1.

Variable Toll is a differential pricing technique based on vehicle occupancy rate. All alternatives have differential pricing in the peak period due to the policy of free toll for carpools. The distinction of Variable Toll for Alternatives 5 and 6 is made to identify the premium toll paid by single-occupant vehicles (Alternative 5 - \$1.50; Alternative 6 - \$2.00) and a lesser toll paid by two-occupant vehicles (Alternative 5 - \$.75; Alternative 6 - \$1.00) in the peak period. For Alternative 5, the Variable Toll was applied at all times, with carpools free only at the peak period.

C. Calibration. The introduction of the time and cost changes, discussed in the section of Assumptions and Limitations in this appendix, and the availability of auto, bus and ferry patronage data for the first half of Fiscal Year 1976/77 created the need to recalibrate the pricing policy model. The recalibration process is a method to establish new sensitivity co-efficients and parameters for estimating patronage response to changes in mode travel time and travel cost factors for each travel zone-to-zone pair. McDonald & Greffe, Inc., performed the recalibration based on data supplied by District staff.

Observed modal split (auto, bus, ferry) bridge vehicular traffic, and bus and ferry patronage data was collected by District staff for the first two quarters of Fiscal Year 1976/77 (July-September, 1976 and October-December 1976). The patronage simulation model was calibrated to reproduce the modal split balance and modal patronage for those two quarters. The base year for travel demand and travel time and cost factors was 1973.

Transbay bus projections were within +/-3% of actual counts. Bridge vehicular traffic projections were within +/-2% of actual counts. Ferry projections were within +/-15% of actual counts. Modifications were introduced after the model produced its modal split to make corrections for ferry patronage.

¹ See Transportation Resources Management and Multi-Modal Pricing Policy, User's Manual for the Pricing Policy Simulation Model (Prepared for the Golden Gate Bridge, Highway and Transportation District and the Metropolitan Transportation Commission, 1975) by McDonald & Smart, Inc., in association with JHK & Associates.

D. Forecasting Assumptions. Before the model runs for the proposed policy alternatives were simulated, the assumptions in the model were tested for accuracy with current and historical conditions, and other District policy and forecasting assumptions. These assumptions are in the categories of:

- (1) Total travel demand annual growth - 2.1%:
TRAVEL DEMAND is the number of person trips for any purpose (work, shopping, recreation or other) between any two travel zones or entirely within a travel zone; and
- (2) Auto occupancy factors for:

Peak & Off-Peak Periods	1.318 people/vehicle
Weekends	2.0 people/vehicle
- (3) Discount Utilization:

<u>Discount</u>	<u>Utilization</u>	
	<u>Peak</u>	<u>Off-Peak</u>
Auto 20%	70%	10%
Auto 10%	50%	5%
Transit 20%	60%	60%
Transit 10%	40%	40%

E. Results. The results of the pricing model for each alternative were analyzed by a series of tests to determine how they matched the criteria established in the discussion of "purpose" previously noted in this appendix.

It is important to note at this point that the pricing model has definite limitations in its ability to forecast patronage and revenues. These limitations are discussed more fully in the section, "Model Description" in this appendix and in detail in the publications prepared by McDonald & Greffe, Inc., that were previously referenced. While these limitations affect predicting the total patronage revenues of a mode, much greater confidence can be placed in the pricing model's ability to simulate the relative shifts in modal patronage allowing comparisons between the several alternatives and the base case of the current toll and fare policy. Adjustments were made to the model output as will be discussed below to make the model output more representative of the total current District patronage. These adjustments were made to all alternatives consistently to ensure that the relative differences for each alternative were maintained.

The first step in the analysis of the results was to examine the base year projections (Fiscal Year 1976-77) with historical data and to examine the forecasted years (Fiscal Years 1977-78 to 1981-82) with the forecasts of established District forecasting techniques. It was determined that the output of the model would have to be manually adjusted to more accurately reflect real conditions of traffic and revenues. The

TABLE 1
TOLL AND FARE ALTERNATIVES

<u>Alternative</u>	<u>Run #</u>	<u>Maximum* Toll</u>	<u>Toll Discount</u>	<u>Maximum** Fare</u>	<u>Fare Discount</u>
Existing***	2.1	\$.75	None	\$1.50	None
1	2.8	\$1.00	20%	\$2.25	20%
2	2.6	\$1.00	None	\$2.25	20%
3	3.5	\$2.00	None	\$2.00	10%
4	2.9	\$1.00	10%	\$2.25	10%
5	4.1	\$1.50 Variable	None	\$2.25	20%
6	4.4	\$2.00 Variable	None	\$2.25	20%

*Carpools (3+ occupants per vehicle) have free tolls in the peak period 6 to 10 a.m. southbound

**Maximum fare from Zone 6 (Sebastopol & Santa Rosa) to San Francisco

***"EXISTING" represents current toll and fare structure and is used as "base line case" for comparing the toll and fare alternative. It is not considered an alternative because the current levels of transit service cannot be maintained with the existing tolls and fares.

most notable areas of correction were:

- (1) Total bridge vehicle revenues adjusted to remove toll-free vehicles;
- (2) Total peak period demand adjusted to match current levels of peak period demand;
- (3) Ferry patronage adjusted to reflect the initial growth of the Larkspur Ferry, which began service after the calibration period;
- (4) Transbay bus patronage adjusted to shift the higher ferry projections to the bus mode; and
- (5) Bus and ferry revenues adjusted to reflect the patronage adjustments.

The second step in the analysis process was to compare the results of the simulation runs of the various policy options based on:

- (1) Total transbay bridge vehicular traffic and transit patronage (see Table 2).
- (2) Morning commute period traffic and revenue (see Table 3); and
- (3) Increase in toll and fare revenues (see Table 4).

The final step in the pricing policy analysis was to compare the various policy alternatives with the established policy goals of:

- (1) Fare box revenues as a % of expenditures (see Table 5);
- (2) No growth in bridge peak period traffic (see Figure 1); and
- (3) Transit patronage, 50% of peak hour commuters carried by transit (see Table 6).

In the overall analysis of the toll and fare increases, the projections of the transit patronage and bridge vehicular traffic produced by the pricing policy model were submitted to the environmental review process. The projections were used as supportive evidence along with other District projections and independent projections by the consultants performing the environmental analysis, to establish the environmental impacts of the District's toll and fare policy choice.

TABLE 2

TOLL BRIDGE TRAFFIC AND TRANSBAY TRANSIT PATRONAGE
WITH TOLL & FARE INCREASES EFFECTIVE JULY 1, 1977

ALT	TOLL:DISC,FARE:DISC	Millions of Vehicles; Millions of Riders Per Year - For Fiscal Years					
		76/77	77/78	78/79	79/80	80/81	81/82
Ex	\$0.75:None,\$1.50:None Vehicles Crossing Bridge Transit Passengers	35.2 7.8	35.9 9.2	36.6 9.4	37.6 9.6	38.3 9.8	39.1 10.1
1	\$1.00:20%,\$2.25:20% Vehicles Crossing Bridge Transit Passengers	35.2 7.8	36.2 8.7	37.0 8.8	38.0 9.1	38.7 9.2	39.6 9.5
2	\$1.00:None,\$2.25:20% Vehicles Crossing Bridge Transit Passengers	35.2 7.8	36.2 8.8	36.9 9.0	37.8 9.2	38.6 9.4	39.4 9.6
3	\$1.00:None,\$2.00:10% Vehicles Crossing Bridge Transit Passengers	35.2 7.8	36.2 8.5	37.0 8.8	37.9 9.0	38.7 9.2	39.6 9.3
4	\$1.00:10%,\$2.25:10% Vehicles Crossing Bridge Transit Passengers	35.2 7.8	36.3 8.5	37.1 8.7	38.1 8.9	38.8 9.1	39.7 9.3
5	\$1.50:None,\$2.25:20% Vehicles Crossing Bridge Transit Passengers	35.2 7.8	34.4 8.7	35.2 8.8	36.1 9.1	36.8 9.3	37.6 9.5
6	\$2.00:None,\$2.25:20% Vehicles Crossing Bridge Transit Passengers	35.2 7.8	34.1 8.6	34.9 8.8	35.8 9.0	36.5 9.2	37.3 9.4

SOURCE: Pricing Policy Simulation Model Five-Year Projections

TABLE 3

MORNING COMMUTE PERIOD (6 to 10 A.M. SOUTHBOUND)
TRAFFIC AND PATRONAGE WITH TOLL AND FARE
INCREASES EFFECTIVE JULY 1, 1977

		Thousands of Vehicles, Thousands of Riders Typical A.M. Commute Period for Fiscal Year					
ALT	TOLL:DISC,FARE:DISC	76/77	77/78	78/79	79/80	80/81	81/82
Ex	\$0.75:None,\$1.50:None Vehicles Crossing Bridge Transit Passengers	21.0 10.4	21.4 11.7	21.9 12.0	22.3 12.3	22.8 12.5	23.3 12.8
1	\$1.00:20%,\$2.25:20% Vehicles Crossing Bridge Transit Passengers	21.0 10.4	21.7 11.1	22.2 11.3	22.7 11.6	23.2 11.8	23.6 12.1
2	\$1.00:None,\$2.25:20% Vehicles Crossing Bridge Transit Passengers	21.0 10.4	21.6 11.3	22.0 11.7	22.5 11.9	23.0 12.2	23.5 12.6
3	\$1.00:None,\$2.00:10% Vehicles Crossing Bridge Transit Passengers	21.0 10.4	21.8 11.0	22.2 11.2	22.7 11.4	23.2 11.7	23.7 11.9
4	\$1.00:10%,\$2.25:10% Vehicles Crossing Bridge Transit Passengers	21.0 10.4	21.9 10.7	22.3 11.0	22.8 11.2	23.3 11.4	23.8 11.7
5	\$1.50:None,\$2.25:20% Vehicles Crossing Bridge Transit Passengers	21.0 10.4	20.0 11.3	20.5 11.6	20.9 11.9	21.3 12.1	21.8 12.4
6	\$2.00:None,\$2.25:20% Vehicles Crossing Bridge Transit Passengers	21.0 10.4	19.0 11.3	19.4 11.5	19.9 11.8	20.3 12.0	20.7 12.3

SOURCE: Pricing Policy Simulation Model Five-Year Projections

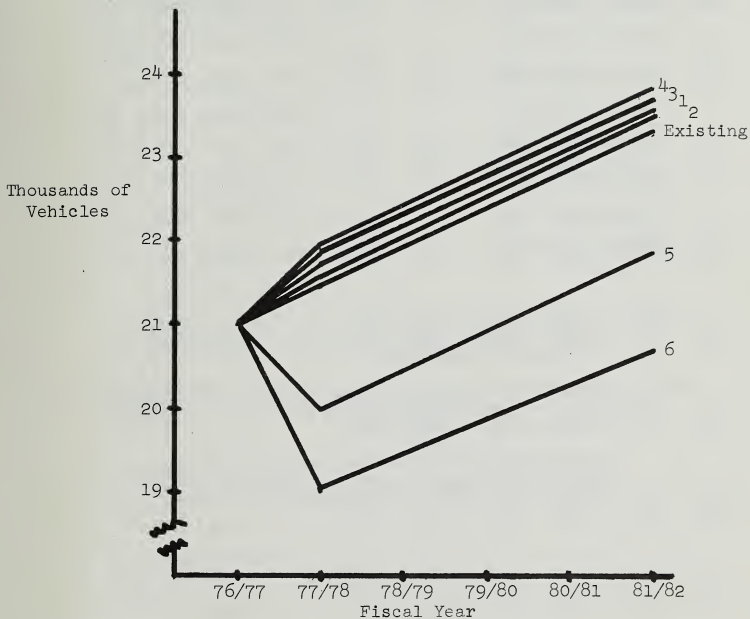
TABLE 4

INCREASES IN TOLL AND FARE REVENUE WITH TOLL AND
FARE ALTERNATIVES EFFECTIVE JULY 1, 1977

		<u>Millions of Dollars for Fiscal Years</u>				
<u>ALT</u>	<u>TOLL:DISC,FARE:DISC</u>	<u>77/78</u>	<u>78/79</u>	<u>79/80</u>	<u>80/81</u>	<u>81/82</u>
Ex	\$0.75:None,\$1.50:None					
	Toll Revenues	13.25	13.55	13.91	14.18	14.49
	Transit Revenues	9.03	9.22	9.44	9.64	9.85
	Total	22.28	22.77	23.35	23.82	24.34
1	\$1.00:20%,\$2.25:20%					
	Toll Revenues	16.52	16.90	17.34	17.68	18.07
	Transit Revenues	10.13	10.33	10.60	10.80	11.04
	Total	26.65	27.23	27.94	28.48	29.11
	Increase	4.37	4.46	4.59	4.66	4.77
2	\$1.00:None,\$2.25:20%					
	Toll Revenues	17.60	18.01	18.47	18.84	19.25
	Transit Revenues	10.25	10.45	10.72	10.94	11.17
	Total	27.85	28.46	29.19	29.78	30.42
	Increase	5.57	5.69	5.84	5.96	6.08
3	\$1.00:None,\$2.00:20%					
	Toll Revenues	17.67	18.07	18.54	18.91	19.32
	Transit Revenues	10.55	10.76	11.05	11.26	11.51
	Total	28.22	28.83	29.59	30.17	30.83
	Increase	5.94	6.06	6.24	6.35	6.49
4	\$1.00:10%,\$2.25:10%					
	Toll Revenues	17.31	17.71	18.16	18.53	18.93
	Transit Revenues	10.46	10.68	10.95	11.21	11.43
	Total	27.77	28.39	29.11	29.74	30.76
	Increase	5.48	5.62	5.76	5.92	6.02
5	\$1.50:None,\$2.25:20%					
	Toll Revenues	19.16	19.59	20.09	20.49	20.94
	Transit Revenues	10.12	10.31	10.59	10.80	11.03
	Total	29.28	29.90	30.68	31.29	31.97
	Increase	6.15	6.25	6.43	6.55	6.70
6	\$2.00:None,\$2.25:20%					
	Toll Revenues	19.99	20.44	20.97	21.39	21.86
	Transit Revenues	10.03	10.27	10.54	10.75	10.98
	Total	30.02	30.71	31.51	32.14	32.84
	Increase	6.89	7.06	7.26	7.40	7.57

SOURCE: Pricing Policy Simulation Model Five-Year Projections

FIGURE 1
AVERAGE DAILY PEAK PERIOD BRIDGE VEHICLE TRAFFIC
(SOUTHBOUND 6 to 10 A.M.)



Alternative	Toll:Discount	Fare:Discount
Existing	\$.75:None	\$1.50:None
1	\$1.00:20%	\$2.25:20%
2	\$1.00:None	\$2.25:20%
3	\$1.00:None	\$2.00:10%
4	\$1.00:10%	\$2.25:10%
5	\$1.50:None	\$2.25:20%
6	\$2.00:None	\$2.25:20%

Source: Pricing Policy Simulation Model 5 Year Projections

TABLE 5

TRANSIT FAREBOX REVENUES AS A % OF TRANSIT EXPENDITURES
WITH TOLL AND FARE INCREASES EFFECTIVE JULY 1, 1977

<u>ALT</u>	<u>TOLL:DISC, FARE:DISC</u>	<u>Revenue/Expenditures for Fiscal Years</u>				
		<u>76/77</u>	<u>77/78</u>	<u>78/79</u>	<u>79/80</u>	<u>80/81</u>
Ex	\$0.75:None,\$1.50:None	41.6	41.4	40.0	38.5	37.2
1	\$1.00:20%,\$2.25:20%	41.6	46.5	44.9	43.3	41.7
2	\$1.00:None,\$2.25:20%	41.6	47.0	45.4	43.8	42.2
3	\$1.00:None,\$2.00:10%	41.6	48.4	46.8	45.1	43.5
4	\$1.00:10%,\$2.25:10%	41.6	48.0	46.4	44.7	43.3
5	\$1.50:None,\$2.25:20%	41.6	46.4	44.8	43.2	41.7
6	\$2.00:None,\$2.25:20%	41.6	46.0	44.7	43.0	41.5

SOURCE: Pricing Policy Simulated Model Five-Year Projections
District Auditor-Controller Five-Year Projections of
Revenue and Expenditures

NOTE: Revenue estimates abstracted from Pricing Policy Simulation
Model runs. Expenditure estimates abstracted from Auditor-
Controller Five-Year Projections.

Revenue and Expenditure estimates are for all District
Transit services: Ferry Transit, Transbay Bus Transit,
Intercounty Bus Transit, and Intracounty Bus Transit.

TABLE 6

ESTIMATE OF TRANSIT AND CARPOOL PERCENTAGE
FOR TOTAL PEAK HOUR TRAVEL

		<u>% of Total Persons Southbound 7 to 8 A.M.</u> <u>Monday thru Friday for Fiscal Years</u>					
<u>ALT</u>	<u>TOLL:DISC:FARE:DISC</u>	<u>76/77</u>	<u>77/78</u>	<u>78/79</u>	<u>79/80</u>	<u>80/81</u>	<u>81/82</u>
Ex	\$0.75:None,\$1.50:None						
	Carpools	12.0	11.5	11.5	11.5	11.5	11.5
	Transit	39.7	42.0	42.0	42.0	42.0	42.0
	Transit & Carpools	51.7	53.5	53.5	53.5	53.5	53.5
1	\$1.00:20%,\$2.25:20%						
	Carpools	12.0	12.0	12.0	12.0	12.0	12.0
	Transit	39.7	40.4	40.4	40.4	40.4	40.4
	Transit & Carpools	51.7	52.4	52.4	52.4	52.4	52.4
2	\$1.00:None,\$2.25:20%						
	Carpools	12.0	12.3	12.3	12.3	12.3	12.3
	Transit	39.7	41.0	41.0	41.0	41.0	41.0
	Transit & Carpools	51.7	53.3	53.3	53.3	53.3	53.3
3	\$1.00:None,\$2.00:10%						
	Carpools	12.0	12.4	12.4	12.4	12.4	12.4
	Carpools	39.7	40.1	40.1	40.1	40.1	40.1
	Transit & Carpools	51.7	52.5	52.5	52.5	52.5	52.5
4	\$1.00:10%,\$2.25:10%						
	Carpools	12.0	12.4	12.4	12.4	12.4	12.4
	Transit	39.7	39.3	39.3	39.3	39.3	39.3
	Transit & Carpools	51.7	51.7	51.7	51.7	51.7	51.7
5	\$1.50:None,\$2.25:20%						
	Carpools	12.0	12.9	12.9	12.9	12.9	12.9
	Transit	39.7	41.4	41.4	41.4	41.4	41.4
	Transit & Carpools	51.7	54.3	54.3	54.3	54.3	54.3
6	\$2.00:None,\$2.25:20%						
	Carpools	12.0	13.6	13.6	13.6	13.6	13.6
	Transit	39.7	41.0	41.0	41.0	41.0	41.0
	Transit & Carpools	51.7	54.6	54.6	54.6	54.6	54.6

SOURCE: Pricing Policy Simulation Model Five-Year Projections

II. MODEL DESCRIPTION

A. The Basic Structure of the Pricing Model. The structure of the pricing model is described in the technical report that was referenced previously, but an understanding of certain assumptions is critical to an interpretation of the results presented here. The pricing model uses the so-called multi-modal logit formulation to estimate the proportion of trips between any two travel zones that will be made by auto, bus and ferry. The model, as formulated, estimates the portion of total travel demand that will select the auto, bus or ferry mode, using two independent variables: a weighted sum of time components (access to the mode, line haul time, egress from the mode, etc.) and a weighted sum of the components of total dollar cost (auto operations, tolls or fares, parking, etc.). Total travel demand is assumed to be fixed, and is estimated exogenously.

A general characteristic of the logit mode is that it deals only with travel demand. There is an implicit assumption that the available capacity of transit modes will be capable of accommodating the estimated demand at the cost levels and travel time characteristics that are used as inputs to the model. The model can deal with supply or capacity constraints only by an iterative process where travel characteristics are modified exogenously and the inputs to the model adjusted appropriately. For example, a constraint on bus capacity could be accommodated by changing the zone-to-zone bus travel time on the assumption that headways would have to be increased.

While the pricing model, as with any simulation model, has definite limitations, it lends itself readily to a comparison between alternative fare policies. In general, greater confidence can be placed in the estimates of relative shifts in modal choice than in total patronage on any mode.

B. Assumptions and Limitations

(1) Travel Demand. Travel demand was unchanged for this series of model runs and was based on the original travel demand estimates used in the development of the model. These were 1973 estimates of travel demand and 1978 forecasts of travel demand. The average annual growth rate of total travel demand was 2.1%. No differentiation was made for the possibility of varying growth rates in the auto, bus or ferry modes. All estimates of patronage for a mode were based on the modal split of the travel demand for each forecasted year.

(2) Travel Time and Cost. The basic zone-to-zone time and cost matrices were values that were applicable in 1973 and used for the initial model development. For this series of model runs, the following modifications were introduced:

(a) New North Marin travel zone with appropriate time and cost factors.

(b) Reduction in peak period Bus Transit time to reflect the exclusive bus lane over Waldo Grade.

(c) Introduction of Larkspur Ferry service; and

(d) Proposed toll and fare changes for all travel zones.

(3) Introduction of Larkspur Ferry Service. The model assumed the Spaulding-class ferries were in service between Larkspur and San Francisco. The model makes no allowance for other than average ferry patronage during the start-up period, rather than a gradual build-up of patronage. It was necessary to adjust the model-estimated ferry patronage to reflect the build-up of patronage to give a truer estimate of District revenue.

(4) Occupancy Rate Changes. The model's structure currently does not have the ability to simulate changing occupancy rate factors that would be expected to occur if variable tolls were introduced or similar policies designed to promote carpools. It was necessary to make several model runs with changing occupancy rate assumptions to simulate the variable toll policies.

ENVIRONMENTAL IMPACT REPORT
PROPOSED TOLL AND FARE INCREASES

APPENDIX C
ESTIMATION OF VEHICLE EMISSIONS AND
FUEL CONSUMPTION

TO: Jerome M. Kuykendall

FROM: Alan Zahradnik

DATE: June 1, 1977

SUBJECT: ESTIMATION OF VEHICLE EMISSIONS AND FUEL CONSUMPTION

This memorandum documents the work performed in the preparation of estimates of vehicular emissions and fuel consumption associated with the alternative fare and toll strategies. References, assumption, and methods used to compute emissions and fuel consumption are presented as support for conclusions on the environmental impact that may be drawn from this data.

AZ/ca
Attachment

ESTIMATION OF VEHICLE EMISSIONS AND FUEL CONSUMPTION

Purpose. In order to assess the impact of alternative toll and fare strategies on air quality and energy consumption, estimates of vehicular (Mobile source) emissions and vehicular fuel consumption were required for each alternative. At the request of the consultant, District staff prepared from available sources the required emissions and fuel consumption estimates which are presented in this appendix. After approving the sources and methods used, the consultant evaluated the estimates with regard to environmental impact. The consultant's assessments of air quality and energy effects associated with the alternatives are presented in Sections 4.4 and 4.5 of the Draft Environmental Report.

Methodology. The Pricing Policy Simulation Model (see Appendix B for a description of the model utilization) projections of (1) number of vehicles crossing the Golden Gate Bridge, (2) number of transbay bus patrons, and (3) number of ferry patrons annually for each alternative over the years 1976/77 through 1981/82, were the basis of staff estimates of associated vehicular emissions and fuel consumption.

The following strategy (based in part on the method used in MTC's Toll Increase and Peninsula Transit EIR's) was chosen to compute emissions and fuel consumption. First, numbers of vehicles and transit patrons were converted to annual vehicle miles traveled (VMT) associated with transbay commute trips. Then, as VMT, emissions factors (tons of pollutants emitted per vehicle mile) and fuel consumption rates (gallons of fuel consumed per vehicle mile) were applied directly to compute emissions and fuel consumption (VMT multiplied by emissions factors equals emissions, VMT multiplied by fuel consumption rates equals fuel consumption).

Auto fuel consumption rates were available through a number of published sources. However, most rates were for past years and relatively useless for a five-year projection since auto fuel consumption characteristics are continually changing over time. The reference finally chosen (see following Assumptions and References section) gave projections of fuel consumption rates that could be applied to the years in question in this report (1976/77 - 1981/82) that seemed to realistically consider the evolution of fuel-conscious auto design.

Bus and ferry fuel consumption rates were available through their respective GGBHTD Division staff. While the bus fuel consumption rate represents average fuel consumption for the entire fleet, the ferry fuel consumption rates (one for gas turbine and another for diesel) are based on fuel consumed for a specific day of operation. They may or may not represent time weighted average fuel consumption rates.

Recently, a standard method of computing emissions factors was published by the U.S. EPA (see Assumptions and References section). This method was adopted for computer model application by the California Air Resources Board in the program EMFAC 3 and made available to the District through CALTRANS. Emissions factors were thus computed for autos using EMFAC 3 and for buses and the diesel ferryboat manually using the EPA methodology based on assumptions presented in the Assumptions and References

section. Gas turbine ferryboat emissions factors were taken from manufacturer's data. Emissions factors are presented in Table 1.

While fuel consumption rates and emissions factors were available from reliable outside sources, staff had to rely on local sources of information to compute VMT. Basically, average trip lengths were estimated for 5 categories of transbay travel: (1) transbay auto commute, (2) transbay bus, (3) transbay ferry, (4) auto ferry feeder, and (5) bus ferry feeder. A number of simplifying assumptions were made for this purpose and are listed in the Assumptions and References section. These average trip lengths were then multiplied by the number of annual vehicle trips per category. Auto trips were taken directly from the Simulation Model projections. Bus transbay trips were obtained by dividing Model patronage projections by the bus load factor. Because of sufficient existing capacity relative to the projected increases in ferry patronage, the number of future ferry vehicle trips was assumed to be the same as the number of existing trips except for the addition of runs for a third Larkspur ferryboat in 1977/78.

Ferry feeder auto and bus trips were estimated from ferry patronage projections. Recent Larkspur ferry surveys were used to estimate the proportion of ferry patrons arriving at the terminal by bus and auto. These proportions were applied to ferry patronage to get auto feeder and bus feeder patrons which were then converted to vehicle trips by dividing by average passenger loads.

In this manner, VMT were computed. Multiplying VMT by the emissions factors resulted in estimates of annual emissions (HC, CO, NO_x) for each trip category, year and alternative. Multiplying VMT by the fuel consumption rates resulted in estimates of annual fuel consumption for each mode (the two auto and two bus trip categories were combined), year and alternative. The basic patronage, VMT, fuel consumption, and emissions data for each alternative are presented in Data Sheets 1-8. Summaries of emissions and fuel consumption are presented in Tables 2 and 3.

The following section of the appendix lists the assumptions and references used to estimate emissions factors, fuel consumption rates, and vehicle miles traveled.

The results of these computations are presented in Tables 1, 2 and 3, and Data Sheets 1-8. and conclude this appendix.

ASSUMPTIONS AND REFERENCES

Table 1, Emissions Factors. Auto emissions factors computed using Air Resources Board EMFAC 3 Model which is based on U.S. EPA Publication AP-42 with Supplements 1-5, Compilation of Air Pollutant Emissions Factors, February 1976.

Assumptions inherent to model:

Vehicle Distribution - 84.7% autos
13.8% light-duty trucks
1.0% heavy-duty trucks
0.5% heavy-duty diesel

California emissions standards - THC, CO, NO_x, 0.9, 9.0, 2.0 (1976)
0.41, 9.0, 1.5 (1977/79)
0.41, 3.4, 1.0 (1980+) grams per mile

Model input: 60 degrees average ambient air temperature

Average transbay trip length = 23.6 miles of which:

2.8 miles at 25 mph average speed and 50% cold operation
15.7 miles at 45 mph average speed and 2% cold operation
5.1 miles at 20 mph average speed and 35% cold operation

No hot starts

These are assumed transbay auto characteristics. Auto feeder characteristics similar to the 2.8-mile portion of the transbay trip.

Bus emissions factors computed using method for heavy-duty diesel city bus found in: Compilation of Air Pollutant Emissions Factors, U.S. EPA, AP-42, Second Edition, Part 1. Third Printing with Supplements 1-5, February 1976. Assuming a homogeneous bus fleet with average speed = 23.7 mph for transbay bus and 18.4 mph for ferry feeder bus.

Gas turbine ferryboat emissions factors based on manufacturer's data supplied by Bill Stevens, GGBHTD, Ferry Division. Diesel ferryboat emissions factors computed using method for heavy-duty diesel vehicles found in previously referenced U.S. EPA, AP-42, assuming 12.65 mph average speed.

Data Sheets 1-8. Number of transbay autos, bus and ferry patrons are from the McDonald & Smart model. Note that all references to AUTO actually include 1.5% heavy-duty trucks and buses. Number of AUTO and BUS feeder patrons are for FERRY FEEDER only and come from the latest survey of Larkspur ferry access mode: 64.3% AUTO and 25.5% BUS. AUTO and BUS feeder to the transbay bus could not be estimated with reasonable accuracy. However, it can be assumed that bus feeder is local bus service which is independent of transbay service.

Auto feeder to ferry assumed to have a 1.12 occupancy rate.
Vehicle miles traveled are based on the following:

AVERAGE TRIP LENGTHS:	Transbay Auto	= 23.6 miles
	Transbay Bus	= 38.2 miles
	Bus Feeder	= 10.4 miles
	Auto Feeder	= 3.3 miles
	Ferry (Larkspur)	= 11.5 nautical miles
	Ferry (Sausalito)	= 5.5 nautical miles

Auto trip lengths based on trip distribution and highway network data from: Marin County Balanced Transportation Program, Phase II, and Phase III - Lower Ross Valley Transportation Study, trip tables for Alternative B.

Bus trip lengths computed using data compiled in GGBHTD Master File trip reports 7-1-76 to 12-31-76 for transbay and ferry feeder bus routes.

Ferry trip lengths supplied by Bill Stevens and Eric Robinson, GGBHTD, Ferry Division.

5.1 mpg bus fuel consumption rate is the Golden Gate Transit fleet average supplied by Wayne Diggs, GGBHTD, Bus Division.

Ferry Fuel consumption rates based on 600 gallons/day used by M.V. Golden Gate (diesel) and 3,000 gallons/day used by G.T. Marin (10 trips). Figures supplied by Bill Stevens, GGBHTD, Ferry Division.

Auto fuel consumption rates = 13.7 mpg (76/77), 14.0 mpg (77/78), 14.3 mpg (78/79), 14.6 mpg (79/80), 15.0 mpg (80/81), 15.6 mpg (81/82). Based on data found in: The Report by the Federal Task Force on Motor Vehicle Goals Beyond 1980, Volume 2, Task Force Report, U.S. GPO #A-0612/725, September 2, 1976, assuming emissions level II, existing technology, weight-conscious auto design (Scenario #1). 40 passengers per bus load factor is fleet average supplied by Mike Cassity, GGBHTD, Planning and Research Department.

Sausalito ferry service assumed to maintain existing number of runs. Larkspur ferry service assumed to maintain existing 2-boat runs in 1976/77 but in 1977/78, and on, will add 6 weekday runs due to 3-boat operation.

Bus average speeds from route "speed plots" courtesy of Mike Cassity, GGBHTD, Planning and Research Department.

Auto freeway speeds based on data provided by Jim McCracken, CALTRANS District 04.

Percentage of trucks and buses on freeway and over Golden Gate Bridge based on data provided by Kay Kendall, CALTRANS, and statistics compiled in GGBHTD 1976 Monthly Statistical Summary.

Average ambient air temperature provided by the San Rafael Chamber of Commerce.

Tables 2 and 3 are summaries of Data Sheets 1-8.

TABLE 1
ESTIMATED VEHICULAR EMISSIONS FACTORS (10^{-6} tons/mile)

		<u>76/77</u>	<u>77/78</u>	<u>78/79</u>	<u>79/80</u>	<u>80/81</u>	<u>81/82</u>
TRANSBAY AUTO	CO	35.0	31.2	26.8	22.8	19.1	16.0
	HC	5.8	5.3	4.7	4.2	3.6	3.0
	NO _x	4.7	4.4	4.0	3.65	3.3	3.0
TRANSBAY BUS	CO	16.8	16.8	16.8	16.8	16.8	16.8
	HC	3.6	3.6	3.6	3.6	3.6	3.6
	NO _x	26.5	26.5	26.5	26.5	26.5	26.5
FERRY							
GAS TURBINE	CO	619.4	619.4	619.4	619.4	619.4	619.4
	HC	17.7	17.7	17.7	17.7	17.7	17.7
	NO _x	929.0	929.0	929.0	929.0	929.0	929.0
DIESEL	CO	28.3	28.3	28.3	28.3	28.3	28.3
	HC	4.8	4.8	4.8	4.8	4.8	4.8
	NO _x	21.3	21.3	21.3	21.3	21.3	21.3
AUTO FEEDER	CO	69.0	63.9	56.1	49.1	42.1	36.4
	HC	7.7	7.0	6.3	5.6	4.7	4.0
	NO _x	4.1	4.0	3.6	3.4	3.1	2.9
BUS FEEDER	CO	22.8	22.8	22.8	22.8	22.8	22.8
	HC	4.3	4.3	4.3	4.3	4.3	4.3
	NO _x	23.9	23.9	23.9	23.9	23.9	23.9

NOTES: Ferry emissions factors are in 10^{-6} tons/nautical mile

DATA SHEET - 1

HYPOTHETICAL EXISTING

	76/77	77/78	78/79	79/80	80/81	81/82
# TRANSBAY AUTOS (millions)	35.23	35.78	36.61	37.55	38.30	39.14
# TRANSBAY BUS PATRONS	5.76	5.89	6.00	6.16	6.29	6.42
# FERRY PATRONS	2.03	3.32	3.40	3.48	3.55	3.63
# AUTO FEEDER PATRONS	1.30	2.13	2.19	2.24	2.28	2.33
# BUS FEEDER PATRONS	0.51	0.84	0.86	0.88	0.89	0.91

NOTE: Does not include auto or bus feeder to transbay bus

TRANSBAY AUTO VMT (millions)	831.43	844.41	864.00	886.18	903.88	923.70
TRANSBAY BUS VMT	5.50	5.62	5.73	5.88	6.01	6.13
FERRY VMT	0.12	0.14	0.14	0.14	0.14	0.14
AUTO FEEDER VMT	3.82	6.26	6.43	6.58	6.70	6.84
BUS FEEDER VMT	0.13	0.22	0.22	0.23	0.23	0.24

FUEL CONSUMPTION (millions of gallons of fuel)

AUTO	60.97	60.76	60.87	61.15	60.70	59.65
BUS	1.10	1.14	1.17	1.20	1.22	1.25
FERRY	2.51	2.97	2.97	2.97	2.97	2.97

EMISSIONS (thousands of tons of pollutants)

TRANSBAY AUTO	CO	29.10	26.35	23.15	20.20	17.26	14.78
	HC	4.82	4.47	4.06	3.72	3.25	2.77
	NO _x	3.91	3.71	3.46	3.23	2.98	2.77
TRANSBAY BUS	CO	0.09	0.09	0.10	0.10	0.10	0.10
	HC	0.02	0.02	0.02	0.02	0.02	0.02
	NO _x	0.15	0.15	0.15	0.16	0.16	0.16
FERRY	CO	0.06	0.07	0.07	0.07	0.07	0.07
	HC	*	*	*	*	*	*
	NO _x	0.08	0.10	0.10	0.10	0.10	0.10
AUTO FEEDER	CO	0.26	0.40	0.36	0.32	0.28	0.25
	HC	0.03	0.04	0.04	0.04	0.03	0.03
	NO _x	0.02	0.02	0.02	0.02	0.02	0.02
BUS FEEDER	CO	*	*	*	*	*	*
	HC	*	*	*	*	*	*
	NO _x	*	*	*	*	*	0.01

NOTE: * less than 10 tons

DATA SHEET - 2

ALTERNATIVE 1: \$1.00 TOLL - 20% DISCOUNT, \$2.25 MAXIMUM FARE - 20% DISCOUNT

	76/77	77/78	78/79	79/80	80/81	81/82
# TRANSBAY AUTOS (millions)	35.23	36.17	37.00	37.95	38.71	39.55
# TRANSBAY BUS PATRONS	5.76	5.48	5.59	5.74	5.86	5.98
# FERRY PATRONS	2.03	3.18	3.25	3.33	3.39	3.47
# AUTO FEEDER PATRONS	1.30	2.04	2.09	2.14	2.18	2.23
# BUS FEEDER PATRONS	0.51	0.80	0.82	0.84	0.85	0.87

NOTE: Does not include auto or bus feeder to transbay bus

TRANSBAY AUTO VMT (millions)	831.43	853.61	873.20	895.62	913.56	933.58
TRANSBAY BUS VMT	5.50	5.23	5.34	5.48	5.60	5.71
FERRY VMT	0.12	0.14	0.14	0.14	0.14	0.14
AUTO FEEDER VMT	3.82	5.99	6.14	6.28	6.40	6.55
BUS FEEDER VMT	0.13	0.21	0.21	0.22	0.22	0.23

FUEL CONSUMPTION (millions of gallons of fuel)

AUTO	60.97	61.40	61.49	61.77	61.33	60.26
BUS	1.10	1.07	1.09	1.12	1.14	1.16
FERRY	2.51	2.97	2.97	2.97	2.97	2.97

EMISSIONS (thousands of tons of pollutants)

TRANSBAY AUTO	CO	29.10	26.63	23.40	20.42	17.45	14.93
	HC	4.83	4.52	4.10	3.76	3.29	2.80
	NO _x	3.91	3.76	3.49	3.27	3.01	2.80
TRANSBAY BUS	CO	0.09	0.09	0.09	0.09	0.09	0.10
	HC	0.02	0.02	0.02	0.02	0.02	0.02
	NO _x	0.15	0.14	0.14	0.14	0.14	0.15
FERRY	CO	0.06	0.07	0.07	0.07	0.07	0.07
	HC	*	*	*	*	*	*
	NO _x	0.08	0.10	0.10	0.10	0.10	0.10
AUTO FEEDER	CO	0.26	0.38	0.34	0.31	0.27	0.24
	HC	0.03	0.04	0.04	0.03	0.03	0.03
	NO _x	0.02	0.02	0.02	0.02	0.02	0.02
BUS FEEDER	CO	*	*	*	*	*	*
	HC	*	*	*	*	*	*
	NO _x	*	*	*	*	*	*

NOTE: * less than 10 tons

DATA SHEET - 3

ALTERNATIVE 2: \$1.00 TOLL - NO DISCOUNT, \$2.25 MAXIMUM FARE - 20% DISCOUNT

	76/77	77/78	78/79	79/80	80/81	81/82
# TRANSBAY AUTOS (millions)	35.23	36.06	36.89	37.84	38.59	39.44
# TRANSBAY BUS PATRONS	5.76	5.60	5.71	5.85	5.98	6.10
# FERRY PATRONS	2.03	3.21	3.28	3.37	3.43	3.51
# AUTO FEEDER PATRONS	1.30	2.06	2.11	2.17	2.20	2.26
# BUS FEEDER PATRONS	0.51	0.81	0.83	0.85	0.86	0.88

NOTE: Does not include auto or bus feeder to transbay bus

TRANSBAY AUTO VMT (millions)	831.43	851.02	870.60	893.02	910.72	930.78
TRANSBAY BUS VMT	5.50	5.35	5.45	5.59	5.71	5.82
FERRY VMT	0.12	0.14	0.14	0.14	0.14	0.14
AUTO FEEDER VMT	3.82	6.05	6.20	6.37	6.46	6.64
BUS FEEDER VMT	0.13	0.21	0.22	0.22	0.22	0.23

FUEL CONSUMPTION (millions of gallons of fuel)

AUTO	60.97	61.22	61.31	61.60	61.14	60.09
BUS	1.10	1.09	1.11	1.14	1.16	1.19
FERRY	2.51	2.97	2.97	2.97	2.97	2.97

EMISSIONS (thousands of tons of pollutants)

TRANSBAY AUTO	CO	29.10	26.55	23.33	20.36	17.39	14.89
	HC	4.82	4.51	4.09	3.75	3.28	2.79
	NO _x	3.91	3.74	3.48	3.26	3.00	2.79
TRANSBAY BUS	CO	0.09	0.09	0.09	0.09	0.10	0.10
	HC	0.02	0.02	0.02	0.02	0.02	0.02
	NO _x	0.15	0.14	0.14	0.15	0.15	0.15
FERRY	CO	0.06	0.07	0.07	0.07	0.07	0.07
	HC	*	*	*	*	*	*
	NO _x	0.08	0.10	0.10	0.10	0.10	0.10
AUTO FEEDER	CO	0.26	0.39	0.35	0.31	0.27	0.24
	HC	0.03	0.04	0.04	0.04	0.03	0.03
	NO _x	0.02	0.02	0.02	0.02	0.02	0.02
BUS FEEDER	CO	*	*	*	*	*	*
	HC	*	*	*	*	*	*
	NO _x	*	*	*	*	*	*

NOTE: * less than 10 tons

DATA SHEET - 4

ALTERNATIVE 3: \$1.00 TOLL - NO DISCOUNT, \$2.00 MAXIMUM FARE - 10% DISCOUNT

	76/77	77/78	78/79	79/80	80/81	81/82
# TRANSBAY AUTOS (millions)	35.23	36.19	37.03	37.96	38.74	39.58
# TRANSBAY BUS PATRONS	5.76	5.45	5.56	5.70	5.82	5.94
# FERRY PATRONS	2.03	3.18	3.24	3.33	3.39	3.47
# AUTO FEEDER PATRONS	1.30	2.04	2.08	2.14	2.18	2.23
# BUS FEEDER PATRONS	0.51	0.80	0.82	0.84	0.85	0.87

NOTE: Does not include auto or bus feeder to transbay bus

TRANSBAY AUTO VMT (millions)	831.43	854.08	873.91	895.86	914.26	934.09
TRANSBAY BUS VMT	5.50	5.22	5.31	5.44	5.56	5.67
FERRY VMT	0.12	0.14	0.14	0.14	0.14	0.14
AUTO FEEDER VMT	3.82	5.99	6.11	6.28	6.40	6.55
BUS FEEDER VMT	0.13	0.21	0.21	0.22	0.22	0.23

FUEL CONSUMPTION (millions of gallons of fuel)

AUTO	60.97	61.43	61.54	61.79	61.38	60.30
BUS	1.10	1.06	1.08	1.11	1.13	1.16
FERRY	2.51	2.97	2.97	2.97	2.97	2.97

EMISSIONS (thousands of tons of pollutants)

TRANSBAY AUTO	CO	29.10	26.65	23.42	20.43	17.46	14.94
	HC	4.82	4.53	4.11	3.76	3.29	2.80
	NO _x	3.91	3.76	3.50	3.27	3.02	2.80
TRANSBAY BUS	CO	0.09	0.09	0.09	0.09	0.09	0.09
	HC	0.02	0.02	0.02	0.02	0.02	0.02
	NO _x	0.15	0.14	0.14	0.14	0.15	0.15
FERRY	CO	0.06	0.07	0.07	0.07	0.07	0.07
	HC	*	*	*	*	*	*
	NO _x	0.08	0.10	0.10	0.10	0.10	0.10
AUTO FEEDER	CO	0.26	0.38	0.34	0.31	0.27	0.24
	HC	0.03	0.04	0.04	0.03	0.03	0.03
	NO _x	0.02	0.02	0.02	0.02	0.02	0.02
BUS FEEDER	CO	*	*	*	*	*	*
	HC	*	*	*	*	*	*
	NO _x	*	*	*	*	*	*

NOTE: * less than 10 tons

DATA SHEET - 5

ALTERNATIVE 4: \$1.00 TOLL - 10% DISCOUNT, \$2.25 MAXIMUM FARE - 10% DISCOUNT

	76/77	77/78	78/79	79/80	80/81	81/82
# TRANSBAY AUTOS (millions)	35.23	36.28	37.11	38.07	38.83	39.67
# TRANSBAY BUS PATRONS	5.76	5.35	5.45	5.59	5.71	5.83
# FERRY PATRONS	2.03	3.16	3.24	3.32	3.39	3.46
# AUTO FEEDER PATRONS	1.30	2.03	2.08	2.13	2.18	2.22
# BUS FEEDER PATRONS	0.51	0.80	0.82	0.84	0.85	0.87

NOTE: Does not include auto or bus feeder to transbay bus

TRANSBAY AUTO VMT (millions)	831.43	856.21	875.80	898.45	916.39	936.21
TRANSBAY BUS VMT	5.50	5.11	5.22	5.34	5.45	5.57
FERRY VMT	0.12	0.14	0.14	0.14	0.14	0.14
AUTO FEEDER VMT	3.82	5.96	6.11	6.26	6.40	6.52
BUS FEEDER VMT	0.13	0.21	0.21	0.22	0.22	0.23

FUEL CONSUMPTION (millions of gallons of fuel)

AUTO	60.97	61.58	61.67	61.97	61.52	60.43
BUS	1.10	1.04	1.06	1.09	1.11	1.14
FERRY	2.51	2.97	2.97	2.97	2.97	2.97

EMISSIONS (thousands of tons of pollutants)

TRANSBAY AUTO	CO	29.10	26.71	23.47	20.48	17.50	14.98
	HC	4.82	4.54	4.12	3.77	3.30	2.81
	NO _x	3.91	3.77	3.50	3.28	3.02	2.81
TRANSBAY BUS	CO	0.09	0.09	0.09	0.09	0.09	0.09
	HC	0.02	0.02	0.02	0.02	0.02	0.02
	NO _x	0.15	0.13	0.14	0.14	0.14	0.14
FERRY	CO	0.06	0.07	0.07	0.07	0.07	0.07
	HC	*	*	*	*	*	*
	NO _x	0.08	0.10	0.10	0.10	0.10	0.10
AUTO FEEDER	CO	0.26	0.38	0.34	0.31	0.27	0.24
	HC	0.03	0.04	0.04	0.03	0.03	0.03
	NO _x	0.02	0.02	0.02	0.02	0.02	0.02
BUS FEEDER	CO	*	*	*	*	*	*
	HC	*	*	*	*	*	*
	NO _x	*	*	*	*	*	*

NOTE: * less than 10 tons

DATA SHEET - 6

ALTERNATIVE 5: \$1.50 TOLL - NO DISCOUNT, \$2.25 MAXIMUM FARE - 20% DISCOUNT

	76/77	77/78	78/79	79/80	80/81	81/82
# TRANSBAY AUTOS (millions)	35.23	34.385	35.19	36.09	36.81	37.61
# TRANSBAY BUS PATRONS	5.76	5.48	5.59	5.73	5.85	5.98
# FERRY PATRONS	2.03	3.19	3.25	3.34	3.41	3.48
# AUTO FEEDER PATRONS	1.30	2.05	2.09	2.15	2.19	2.24
# BUS FEEDER PATRONS	0.51	0.80	0.82	0.84	0.86	0.88

NOTE: Does not include auto or bus feeder to transbay bus

TRANSBAY AUTO VMT (millions)	831.43	811.49	830.48	851.72	868.72	887.60
TRANSBAY BUS VMT	5.50	5.23	5.34	5.47	5.59	5.71
FERRY VMT	0.12	0.14	0.14	0.14	0.14	0.14
AUTO FEEDER VMT	3.82	6.02	6.14	6.31	6.43	6.61
BUS FEEDER VMT	0.13	0.21	0.21	0.22	0.22	0.23

FUEL CONSUMPTION (millions of gallons of fuel)

AUTO	60.97	58.39	58.50	58.78	58.34	57.32
BUS	1.10	1.07	1.09	1.12	1.14	1.16
FERRY	2.51	2.97	2.97	2.97	2.97	2.97

EMISSIONS (thousands of tons of pollutants)

TRANSBAY AUTO	CO	29.10	25.32	22.26	19.42	16.59	14.20
	HC	4.82	4.30	3.90	3.58	3.13	2.66
	NO _x	3.91	3.57	3.32	3.11	2.87	2.66
TRANSBAY BUS	CO	0.09	0.09	0.09	0.09	0.09	0.10
	HC	0.02	0.02	0.02	0.02	0.02	0.02
	NO _x	0.15	0.14	0.14	0.14	0.15	0.15
FERRY	CO	0.06	0.07	0.07	0.07	0.07	0.07
	HC	*	*	*	*	*	*
	NO _x	0.08	0.10	0.10	0.10	0.10	0.10
AUTO FEEDER	CO	0.26	0.38	0.34	0.31	0.27	0.24
	HC	0.03	0.04	0.04	0.03	0.03	0.03
	NO _x	0.02	0.02	0.02	0.02	0.02	0.02
BUS FEEDER	CO	*	*	*	*	*	*
	HC	*	*	*	*	*	*
	NO _x	*	*	*	*	*	*

NOTE: * less than 10 tons

ALTERNATIVE 6: \$2.00 TOLL - NO DISCOUNT, \$2.25 MAXIMUM FARE - 20% DISCOUNT

	<u>76/77</u>	<u>77/78</u>	<u>78/79</u>	<u>79/80</u>	<u>80/81</u>	<u>81/82</u>
# TRANSBAY AUTOS (millions)	35.23	34.06	34.86	35.76	36.46	37.26
# TRANSBAY BUS PATRONS	5.76	5.49	5.56	5.70	5.82	5.94
# FERRY PATRONS	2.03	3.13	3.23	3.31	3.38	3.46
# AUTO FEEDER PATRONS	1.30	2.01	2.08	2.13	2.17	2.22
# BUS FEEDER PATRONS	0.51	0.79	0.81	0.83	0.85	0.87

NOTE: Does not include auto or bus feeder to transbay bus

TRANSBAY AUTO VMT (millions)	831.43	803.82	822.70	843.94	860.46	879.34
TRANSBAY BUS VMT	5.50	5.24	5.31	5.44	5.56	5.67
FERRY VMT	0.12	0.14	0.14	0.14	0.14	0.14
AUTO FEEDER VMT	3.82	5.91	6.11	6.26	6.37	6.52
BUS FEEDER VMT	0.13	0.20	0.21	0.22	0.22	0.23

FUEL CONSUMPTION (millions of gallons of fuel)

AUTO	60.97	57.84	57.96	58.23	57.79	56.79
BUS	1.10	1.07	1.08	1.11	1.13	1.16
FERRY	2.51	2.97	2.97	2.97	2.97	2.97

EMISSIONS (thousands of tons of pollutants)

TRANSBAY AUTO	CO	29.10	25.08	22.05	19.24	16.43	14.07
	HC	4.82	4.26	3.87	3.54	3.10	2.64
	NO _x	3.91	3.54	3.29	3.08	2.84	2.64
TRANSBAY BUS	CO	0.09	0.09	0.09	0.09	0.09	0.09
	HC	0.02	0.02	0.02	0.02	0.02	0.02
	NO _x	0.15	0.14	0.14	0.14	0.15	0.15
FERRY	CO	0.06	0.07	0.07	0.07	0.07	0.07
	HC	*	*	*	*	*	*
	NO _x	0.08	0.10	0.10	0.10	0.10	0.10
AUTO FEEDER	CO	0.26	0.38	0.34	0.31	0.27	0.24
	HC	0.03	0.04	0.04	0.03	0.03	0.03
	NO _x	0.02	0.02	0.02	0.02	0.02	0.02
BUS FEEDER	CO	*	*	*	*	*	*
	HC	*	*	*	*	*	*
	NO _x	*	*	*	*	*	*

NOTE: * less than 10 tons

ALTERNATIVE

ALTERNATIVE 7: REDUCE TRANSIT

	<u>76/77</u>	<u>77/78</u>	<u>78/79</u>	<u>79/80</u>	<u>80/81</u>	<u>81/82</u>
# TRANSBAY AUTOS (millions)	35.2	35.8	37.9	39.4	40.6	41.8
# TRANSBAY BUS PATRONS	5.8	5.9	4.7	4.4	3.9	3.6
# FERRY PATRONS	2.0	3.3	2.7	2.4	2.2	2.0
# AUTO FEEDER PATRONS	1.3	2.1	1.7	1.5	1.4	1.3
# BUS FEEDER PATRONS	0.5	0.8	0.7	0.6	0.5	0.5

NOTE: (1)

TRANSBAY AUTO VMT (millions)	830.7	844.9	894.4	929.8	958.2	986.5
TRANSBAY BUS VMT	5.5	5.6	4.5	4.2	3.7	3.4
FERRY VMT	0.12	0.14	0.11	0.11	0.11	0.11
AUTO FEEDER VMT	3.8	6.2	5.0	4.4	4.1	3.8
BUS FEEDER VMT	0.1	0.2	0.2	0.2	0.1	0.1

FUEL CONSUMPTION (millions of gallons of fuel)

AUTO	60.9	60.6	62.9	64.0	64.1	63.5
BUS	1.1	1.1	0.9	0.9	0.7	0.7
FERRY	2.51	2.97	2.45	2.45	2.45	2.45

EMISSIONS (thousands of tons of pollutants)

TRANSBAY AUTO	CO	29.07	26.36	23.97	21.20	18.30	15.78
	HC	4.82	4.48	4.20	3.90	3.45	2.96
	NO _x	3.90	3.72	3.58	3.39	3.16	2.96
TRANSBAY BUS	CO	0.09	0.09	0.08	0.07	0.06	0.06
	HC	0.02	0.02	0.02	0.01	0.01	0.01
	NO _x	0.15	0.15	0.12	0.11	0.10	0.09
FERRY	CO	0.06	0.07	0.05	0.05	0.05	0.05
	HC	*	*	*	*	*	*
	NO _x	0.08	0.10	0.08	0.08	0.08	0.08
AUTO FEEDER	CO	0.26	0.40	0.28	0.22	0.17	0.14
	HC	0.03	0.04	0.03	0.02	0.02	0.01
	NO _x	0.02	0.02	0.02	0.01	0.01	0.01
BUS FEEDER	CO	*	*	*	*	*	*
	HC	*	*	*	*	*	*
	NO _x	*	*	*	*	*	*

NOTE: (2)

NOTE: (3)

(1) Assumes 21% cut in ferry service 78/79 on. Assumes 21% cut in transbay bus service in 78/79 and additional cuts afterwards to give total transbay cuts of 29%, 38%, and 43% in years 79/80, 80/81, 81/82 respectively. Neglects cuts in feeder service. Does not include feeder to transbay bus. (2) Although taken to two decimal places, use only one decimal place to reflect loss of accuracy. (3) *less than 10 tons.

TABLE 2. SUMMARY - VEHICULAR EMISSIONS (thousands of tons) AND FUEL CONSUMPTION (millions of gallons)

ALTERNATIVE	TYPE	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82
Hypothetical Existing	Emissions						
	CO	29.51	26.91	23.68	20.69	17.71	15.20
	HC	4.87	4.53	4.12	3.78	3.30	2.82
	NO _x	4.16	3.98	3.73	3.51	3.26	3.06
	Fuel						
	Auto	60.97	60.76	60.87	61.15	60.70	59.65
	Bus	1.10	1.14	1.17	1.20	1.22	1.25
	Ferry	2.51	2.97	2.97	2.97	2.97	2.97
\$1.00 Toll 20% Discount \$2.25 Maximum Fare 20% Discount 1	Emissions						
	CO	29.51	27.17	23.90	20.89	17.88	15.34
	HC	4.87	4.58	4.16	3.81	3.34	2.85
	NO _x	4.16	4.02	3.75	3.53	3.27	3.07
	Fuel						
	Auto	60.97	61.40	61.49	61.77	61.33	60.26
	Bus	1.10	1.07	1.09	1.12	1.14	1.16
	Ferry	2.51	2.97	2.97	2.97	2.97	2.97
2	Emissions						
	CO	29.51	27.10	23.84	20.83	17.83	15.30
	HC	4.87	4.57	4.15	3.81	3.33	2.84
	NO _x	4.16	4.00	3.74	3.53	3.27	3.06
	Fuel						
	Auto	60.97	61.22	61.31	61.60	61.14	60.09
	Bus	1.10	1.09	1.11	1.14	1.16	1.19
	Ferry	2.51	2.97	2.97	2.97	2.97	2.97
3	Emissions						
	CO	29.51	27.19	23.92	20.90	17.89	15.34
	HC	4.87	4.59	4.17	3.81	3.34	2.85
	NO _x	4.16	4.02	3.76	3.53	3.29	3.07
	Fuel						
	Auto	60.97	61.43	61.54	61.79	61.38	60.30
	Bus	1.10	1.06	1.08	1.11	1.13	1.16
	Ferry	2.51	2.97	2.97	2.97	2.97	2.97
4	Emissions						
	CO	29.51	27.25	23.94	20.95	17.93	15.38
	HC	4.87	4.60	4.18	3.82	3.35	2.86
	NO _x	4.16	4.02	3.76	3.54	3.28	3.07
	Fuel						
	Auto	60.97	61.58	61.67	61.97	61.52	60.43
	Bus	1.10	1.04	1.06	1.09	1.11	1.14
	Ferry	2.51	2.97	2.97	2.97	2.97	2.97
5	Emissions						
	CO	29.51	25.86	22.76	19.89	17.02	14.61
	HC	4.87	4.36	3.96	3.63	3.18	2.71
	NO _x	4.16	3.83	3.58	3.37	3.14	2.93
	Fuel						
	Auto	60.97	58.39	58.50	58.78	58.34	57.32
	Bus	1.10	1.07	1.09	1.12	1.14	1.16
	Ferry	2.51	2.97	2.97	2.97	2.97	2.97
6	Emissions						
	CO	29.51	25.62	22.55	19.71	16.86	14.47
	HC	4.87	4.32	3.93	3.59	3.15	2.69
	NO _x	4.16	3.80	3.55	3.34	3.11	2.91
	Fuel						
	Auto	60.97	57.84	57.96	58.23	57.79	56.29
	Bus	1.10	1.07	1.08	1.11	1.13	1.16
	Ferry	2.51	2.97	2.97	2.97	2.97	2.97
7	Emissions						
	CO	29.5	26.9	24.4	21.5	18.6	16.0
	HC	4.9	4.5	4.25	3.9	3.5	3.0
	NO _x	4.2	4.0	3.8	3.6	3.35	3.1
	Fuel						
	Auto	60.9	60.6	62.9	64.0	64.1	63.5
	Bus	1.1	1.1	0.9	0.9	0.7	0.7
	Ferry	2.5	3.0	2.45	2.45	2.45	2.45

TABLE 3

GROSS COMPARISON OF ALTERNATIVES WITH REGARD TO
ESTIMATED VEHICULAR EMISSIONS* AND FUEL CONSUMPTION**

YEAR	----1976/77----		----1977/78----		----1978/79----		----1979/80----		----1980/81----		----1981/82----	
ALTERNATIVE	TOTAL EMISSION	TOTAL FUEL	TOTAL EMISSION	TOTAL FUEL	TOTAL EMISSION	TOTAL FUEL	TOTAL EMISSION	TOTAL FUEL	TOTAL EMISSION	TOTAL FUEL	TOTAL EMISSION	TOTAL FUEL
Hypothetical Existing	38.54	64.58	35.42	64.87	31.53	65.01	27.98	65.32	24.27	64.89	21.08	63.87
1	38.54	64.58	35.77	65.44	31.81	65.55	28.23	65.86	24.49	65.44	21.26	64.39
2	38.54	64.58	35.67	65.28	31.73	65.39	28.17	65.71	24.43	65.27	21.20	64.25
3	38.54	64.58	35.80	65.46	31.85	65.59	28.24	65.87	24.52	65.48	21.26	64.43
4	38.54	64.58	35.87	65.59	31.88	65.70	28.31	66.03	24.56	65.60	21.31	64.54
5	38.54	64.58	34.05	62.43	30.30	62.56	26.89	62.87	23.34	62.45	20.25	61.45
6	38.54	64.58	33.74	61.88	30.03	62.01	26.64	62.31	23.12	61.89	20.07	60.42
Hypothetical Reduced Transit	38.6	64.5	35.4	64.7	32.45	66.25	29.0	67.35	25.45	67.25	22.1	66.65

*Thousands of tons of pollutants (CO, HC, NO_x)

**Millions of gallons of fuel (gas & diesel)

NOTE: Alternative 7 values rounded to one decimal place to reflect less accurate information.

ENVIRONMENTAL IMPACT REPORT
PROPOSED TOLL AND FARE INCREASES

APPENDIX D

PROSPECTS FOR CONTINUED INFLATION

I. INTRODUCTION

The Golden Gate Bridge, Highway and Transportation District staff has made certain financial projections based on possible bridge toll and transit fare increases. The objective of the proposed toll and fare increases is to raise additional revenues to permit the District to continue to operate its public transportation services in fulfillment of its numerous policies, plans and commitments while at the same time preserving adequate reserves for future repair, modification or improvement of the Golden Gate Bridge.

The proposed increases are summarized and discussed in the main report. A series of alternatives have been presented and evaluated; various combinations of fare and toll increases will give different results and certain recommendations have been made regarding the best possible choices. In Appendix A, financial results have been summarized for a toll and fare increase effective July 1, 1977. In projection of increased revenues is based on a \$1.00 bridge toll with 20% discount and a \$2.25 maximum fare from Santa Rosa to San Francisco with a 20% discount provision. In addition, the financial position has also been projected on the assumption that no toll or fare increases are approved. The situation is considered against three average annual inflation rates: zero, 6 and 10% respectively during the five-year period ending 1980/81.

The purpose of this Appendix is not to re-calculate the financial estimates or repeat what already has been done. Rather, a review has been made of previous assumptions regarding inflation and the significance of labor cost has been analyzed. The District may be particularly susceptible to cost increases in future years with serious consequences for financial viability.

II. THE ECONOMICS OF INFLATION*

Inflation is a monetary phenomenon in the sense that there has never been a serious inflation without an increase in the quantity of money and that inflation cannot be stopped or reduced to a tolerable level without restrictions on monetary growth. If inflation is not stopped, or strongly modified, it will tend to accelerate and eventually become intolerable.

Three types of inflation are normally identified:

(1) Classical Demand Inflation. Monetary expansion in excess of what is needed to match the flow of real goods and services. The new money may be used to finance

*This section is based on the work of Gottfried Haberler, primarily his book, *Economic Growth and Stability: An Analysis of Economic Change and Policy*, (Los Angeles, 1974) and also on a recent series of articles dealing with the problems of inflation.

investment in the private sector and/or to finance a government deficit. This is what Keynes called "profit inflation".

(2) Cost or Wage-Push Inflation. Due to union pressure and monopoly pressure, Keynes' "Income inflation".

(3) The So-called "New" Inflation. Caused by real shortages such as a crop failure, the oil embargo and oil price imposed by OPEC, the disappearance of the anchovies off the coast of Peru and other factors depressing real GNP, either by reducing output or by worsening the international terms of trade.

The different forces causing inflation often operate concurrently, but sometimes it is possible to find periods where the one or the other clearly dominates the picture.

While (1) and (3) will affect the future of the Golden Gate Bridge District in broad terms, it is cost or wage-push inflation that will have the most significant direct effect. It becomes appropriate, therefore, to discuss this in greater detail.

It might be observed that in a competitive economy with flexible wages and prices there would be no such thing as a cost or wage-push. Cost or wage-push inflation implies monopolies or, more generally, the absence of competition. The newest significant monopolies are the labor unions. But what is said about the relation between inflation and labor monopolies holds in principle also of other monopolies. In general, however, other monopolies or oligopolies, except in the public utility area, are of much lesser importance.

What is of great importance, however, are the many ways in which government regulations, restrictions and subsidies keep or push prices up (or alternatively the political pressure groups which force the government to act as it does). In all too many cases where private producers are unable to organize themselves in effective monopolies, the government steps in and, in effect, makes them behave like a monopoly. It is not claimed that the government-sponsored restriction and price maintenance schemes operate exactly as well-organized private monopolies would. What these public policies have in common with private monopolies is that they restrict output, raise prices above the competitive level and make them rigid downward.

Thus, institutional patterns have developed which promote monopolistic practices and build in some degree of inflation. The changed situation of the trade unions has made it possible for them to take advantage of the institutional patterns, but with inflationary consequences. There is a significant body of thought--the monetary economists who oppose this contention. The monetary economists say that there is no such thing as a continuous push on wages and costs by unions. When the monopoly or market power of unions increase, as was the case in the 1930's, there is a one-time increase in wage costs.

Union wages will be higher but--if the monetary authorities stand firm, a new equilibrium will be established presumably with a greater spread between union and non-union wages.

Applied to present conditions the monetary economists would say that there has recently been no increase in monopoly power similar to what happened in the early 1930's. Therefore, the monetary economists are optimistic and say that if monetary-fiscal policy is gradually tightened, unions will moderate their wage demands. As far as the U.S. is concerned, monetary economists point out that only about 25% of the labor force is unionized and that this percentage has shown no tendency to increase.

This is an unduly optimistic view of the situation. It is true that there have been no additional legal immunities or privileges granted to the unions since the early New Deal. But it does not follow that there has been no increase in the monopoly or market power of the unions. There have been important changes in public policy and attitudes which have given the unions much more power than they used to have.

That only some 25% of production workers are unionized is misleading for two reasons. First, higher union wages obtained by threat of strike spread more or less rapidly to the rest of the labor force. Non-union firms are under pressure to match wage increases for workers of similar skills. Secondly, unionization has spread to groups that were not organized before, to public employees and officials in all levels of government; teachers, firemen, policemen, civil servants, and so on. It is undoubtedly true that these developments have been greatly stimulated, if not originally initiated, by inflation, but these changes are here to stay.

The relentless push for higher wages is highlighted by the fact that it seems now to continue even in periods of unemployment. Recent mild recessions have only slowed down but not stopped the rise in money wages, and there are many cases on record of individual industries where, despite substantial unemployment, wages have been pushed up.

Table 1 shows the trend in weekly hours and earnings for the period 1968-76.

Average weekly hours have shown considerable stability throughout the total period; in fact, for total private, non-agricultural labor, average weekly hours declined 4.2% between 1968 and 1976. During the same period, average gross hourly earnings increased by nearly 71%. Department of Labor information shows that between 1968 and 1976 output per hour by workers in the private non-farm business sector rose by only 10%. The evidence is fairly clear that wage costs have increased much faster than productivity throughout the economy but much of the wage gains has been lost by workers because of the inflationary factors that are so persistent.

Table 2 shows the trend of average weekly earnings in private, non-agricultural industries.

TABLE 1

AVERAGE WEEKLY HOURS AND HOURLY EARNINGS
 (Private Non-Agricultural Industries)

<u>Period</u>	<u>Average Weekly Hours</u>			<u>Average Gross Hourly Earnings</u>	
	<u>Total Private</u> <u>Non-Agricultural</u>	<u>Manufacturing</u> <u>Total</u>	<u>Overtime</u>	<u>Total Private</u> <u>Non-Agricultural</u>	<u>Manufacturing</u>
1968	37.8	40.7	3.6	\$2.85	\$3.01
1969	37.7	40.6	3.6	3.04	3.19
1970	37.1	39.8	3.0	3.22	3.36
1971	37.0	39.9	2.9	3.44	3.57
1972	37.1	40.6	3.5	3.67	3.81
1973	37.1	40.7	3.8	3.92	4.08
1974	36.6	40.0	3.2	4.22	4.41
1975	36.1	39.4	2.6	4.54	4.81
1976	36.2	40.0	3.1	4.87	5.19

SOURCE: U.S. Department of Labor

TABLE 2
AVERAGE WEEKLY EARNINGS - PRIVATE NONAGRICULTURAL INDUSTRIES

Period	Average Gross Weekly Earnings				Percent Change From a Year Earlier, Total Private Non-Agricultural	
	Total Private Non-Agricultural Current Dollars	Manufac-turing Current Dollars	Contract Construction Current Dollars	Retail Trade Current Dollars	Current Dollars	1967 Dollars
1968	\$107.73	\$103.39	\$122.51	\$164.49	\$74.95	5.8% 1.5%
1969	114.61	104.38	129.51	181.54	78.66	6.4 1.0
1970	119.46	102.72	133.73	195.45	82.47	4.2 -1.6
1971	127.28	104.93	142.44	211.67	86.61	6.5 2.2
1972	136.16	108.67	154.69	222.51	90.99	7.0 3.6
1973	145.43	109.26	166.06	235.69	95.57	6.8 .5
1974	154.45	104.57	176.40	249.08	101.04	6.2 -4.3
1975	163.89	101.67	189.51	265.35	108.22	6.1 -2.8
1976	176.29	103.40	207.60	284.93	113.96	7.6 1.7

SOURCE: U.S. Department of Labor

This tabulation shows that total private non-agricultural average gross weekly earnings increased by almost 64% between 1968 and 1976, the increase in constant dollars during that period was zero, a startling confirmation of the effects of inflation on real purchasing power.

It is interesting to consider variations in increases in earnings among the industries shown. For manufacturing, the increase was 69%, for contract construction 73%, and for retail trade 52%. It is noteworthy that the industry operating from the largest base (contract construction) also received the greatest monetary gain during this period.

The full effects of inflation can also be seen from a review of wholesale prices; key prices are shown in Table 3.

A similar result is derived from a study of consumer prices; key prices are shown in Table 4.

It is important to appreciate the impact of wage increases on inflation. To understand why price increases have been accelerating at such an alarming rate, it is necessary to go back to the fundamental politico-economic structure of the wage bargaining process. Up until the mid 1960's wage bargaining was carried out with expectations of zero price inflation or with reference to previous levels of inflation and it was under these conditions that full employment was achieved with only moderate rates of inflation resulting. However, as inflation persisted and when exogenous shocks such as the commodity boom and oil price increases caused sudden disruptions to the system, people, informed by the ubiquitous news medium, became increasingly aware of inflation and the erosion of the purchasing power of their money wages, thus increasing their uncertainty about future incomes. Trade union, therefore, began not only to account for inflation but to base their wage claims on expectations of rising inflation. Moreover, as more and more of any increase in income is siphoned into taxation, bargaining is increasingly concerned with take-home pay. Thus, wage rate settlements invariably exceed current rates of inflation though the increase in take-home pay may only equal the rate of inflation, and indeed may be considerably below it. However, taxes are not something separate from the system, they are invariably passed on as cost increases to consumers and moreover can result in government expenditure and consequently increase nominal aggregate demand. These factors serve not only to perpetuate inflation but also exacerbate it, thus causing accelerating price increases.

This alteration of the wage bargaining process has led to an apparent breakdown in the relationship between unemployment and inflation. Whereas, previously any given level of unemployment was associated with a certain rate of inflation, that same level of unemployment is now only reached at higher and accelerating rates of inflation.

The comments that have been made in this section suggest that there is no easy answer to the problems of inflation, given the institutional constraints that have been developed in the economy. It is worth emphasizing that the present inflation is a cost inflation. This is often described

TABLE 3

WHOLESALE PRICES AND PRICE CHANGES
(1967 = 100)

Period	All Commodities	Farm Products & Processed Foods & Feeds	Industrial Commodities	Farm Products	Processed Foods & Feeds	% Change From Preceding Period/Seasonally Adjusted All Commodities Farm Products Processed Foods & Feeds Industrial Commodities			
1969	106.5	108.0	106.0	109.1	107.3	4.8%	8.4%	6.8%	3.9%
1970	110.4	111.7	110.0	111.0	112.1	2.2	-4.7	.8	3.6
1971	114.0	113.9	114.1	112.9	114.5	4.1	8.1	4.7	3.4
1972	119.1	122.4	117.9	125.0	120.8	6.3	18.7	11.6	3.4
1973	134.7	159.1	125.9	176.3	148.1	15.4	36.1	20.3	10.7
1974	160.1	177.4	153.8	187.7	170.9	20.9	-1.9	20.9	25.6
1975	174.9	184.2	171.5	186.7	182.6	4.2	5.5	-3.8	6.0
1976	182.9	183.1	182.3	191.1	178.0	4.7	-1.1	-1.1	6.4

SOURCE: U. S. Department of Commerce

TABLE 4

CONSUMER PRICES AND PRICE CHANGES

(1967 = 100)

Period	All Items	Commodities		Services	All Items	% Change From Preceding Period; Seasonally Adjusted		
		Food	Less Food			Food	Commodities Less Food	Services
1969	109.8	108.9	108.1	112.5	6.1%	7.2%	4.5%	7.4%
1970	116.3	114.9	112.5	121.6	5.5	2.2	4.8	8.2
1971	121.3	118.4	116.8	128.4	3.4	4.3	2.3	4.1
1972	125.3	123.5	119.4	133.3	3.4	4.7	2.5	3.6
1973	133.1	141.4	123.5	139.1	8.8	20.1	5.0	6.2
1974	147.7	161.7	136.6	152.1	12.2	12.2	13.2	11.3
1975	161.2	175.4	149.1	166.6	7.0	6.5	6.2	8.1
1976	170.5	180.8	156.6	180.4	4.8	.6	5.1	7.3

SOURCE: U.S. Department of Commerce

by saying that "excess demand has been squeezed out of the system", a very misleading description; for aggregate demand in the sense of total monetary expenditure is still excessive; i.e., it grows faster than output. What has been squeezed (not squeezed out, but reduced excessively) is profits, a fact which is obscured by the inflationary distortion of the profit figures. For public transportation companies that had usually meant significant increases in subsidies. In both cases, the increase in wages to the employees means additional financial and operational problems for management. When the problem of shortages and the need for additional subsidies is added to wage demands, the inflationary prospects facing the system management are frightening indeed.

III. TRANSIT INDUSTRY LABOR SITUATION

It is appropriate, at this point, to consider what is happening to labor in the transit industry. Although the Golden Gate Bridge District has many categories of employees it is believed that the transit employees, who make up a large proportion of the total, are indicative of the operation as a whole. Trends in transit labor costs and productivity provide guidelines for assessing some of the inflationary components facing the District.

This section is concerned with the industry as a whole. The comments made here apply, with only minor qualification, to the Golden Gate District transit employees. Appropriate adjustments can be made to obtain specific quantification for the Golden Gate situation, if required.

Complete industry data are only available through 1974. It can be expected, therefore, that the following summary will understate the significance of transit labor costs.

Transit workers earned an average of \$5.62 per hour in 1974. This rate was 33% higher than the \$4.24 per hour earned by manufacturing production workers in the same year. Transit workers, however, earned 12% less than the \$6.39 rate of local truck drivers, although they had about the same degree of skill and substantially more responsibility.

Transit wages, along with wages in other industries, have risen rapidly since 1960. Between 1960 and 1974 they increased 137%, compared to increases of 138% for local truck drivers and 88% for manufacturing production workers.

The 137% increase in the top hourly rate of transit workers between 1960 and 1974 was almost matched by the change in average annual earnings, which increased 134% over the same period from \$5,548 to \$12,849 per year. Thus, the increase in hourly rates was directly reflected in the increased annual earnings.

The relationship between transit compensation and compensation in other industries documents the power of the transit industries. The transit industry suffered a major decline throughout the 1960's and early

1970's. Yet transit workers received percentage wage increases almost equal to those received by local truck drivers, who are represented by one of the strongest unions in the country, and whose industry was generally healthy during the period in question. Moreover, transit workers received a percentage increase over 50% greater than that received by production workers in manufacturing. The ability of the transit unions to obtain such large wage increases in spite of the industry's decline is indicative of their power.

Average hourly earnings are, however, only one part of the transit workers' compensation. The picture is not complete until other elements of transit compensation are included. Worker compensation actually includes four elements:

- (1) Base hourly rate;
- (2) Fringe benefits;
- (3) Premium payments; and
- (4) Payments for non-operating time.

When these items are added to the basic hourly wage rate it is clear that the cost is considerably increased. It is suggested that continued increases in wage costs and fringes will create financial problems for the industry (and the Golden Gate Bridge District) unless some innovations can be introduced that will result in productivity increases.

In making assessments of transit productivity, one of the major problems has been to find measures that effectively indicate levels of productivity within an organization and also any changes that may have occurred. The problem is compounded when attempts are made to make comparisons between systems; the geographical, operational and other differences are such as to make comparisons tenuous at best.

Fortunately, the problem has been recognized and a considerable amount of work is now being done to try to establish productivity measures for transit systems. UMTA is aware of the need and is actively supporting research in the area. The most recent and effective work has been done by Meyer and Gomez-Ibanez at Harvard*

It has already been stated that measurement of productivity has been unsatisfactory and the difference of opinion does not seem likely to be immediately resolved. In most activities, and the transit

*J.R. Meyer and J. A. Gomez-Ibanez - Improving Urban Mass Transportation Productivity (February 1977) for Urban Mass Transportation Administration and G. J. Fielding, R. E. Glauthier and C. A. Lave. "Development of Performance Indicators for Transit" (January 1977) prepared for Urban Mass Transportation Administration.

industry is no exception, output is not a function of a single input, but rather is a blend of several distinct resources. Hence, transit services are produced by a blending of labor, capital, land, and energy resources.

Attention is normally directed to relating transit output to a single input measure; i.e., transit labor. Such an approach will yield some output measures per employee over a given time period. In reality, such measurements reflect not only the efficiency with which labor and capital are used, but also the capital employed with each worker, and the average quality of labor. However, under this approach no insight is provided into the relative contributions of any of these factors. Additionally, there are numerous external factors, such as changing conditions in the market for a given good or service that influence reported productivity, and yet are at least partially beyond management control.

Meyer and Gomez-Ibanez agree that a necessary major ingredient in constructing any productivity measure is the trend in the required productive or factor inputs. Three basic types of inputs are considered essential for the production of transit services: labor, capital (such as right-of-way and vehicles), and intermediate goods (e.g., fuel and maintenance materials). The relevant data, for the period 1948-70, are presented in Table 5. 1970 is the last year for which complete data have been assembled. It can be expected that the period since then will reinforce the comments made here. Table 1 shows that the industry's consumption of all of these inputs has been declining in the post-war period.

By weighting the three types of inputs by their relative prices in a base year, an index of total factor inputs can be constructed. Relative prices, as weights, presumably reflect the relative marginal productivities of these inputs.

Although the consumption of inputs has been declining rapidly, the relative mix of the three inputs used by the transit industry has constant. Some of these quality changes not reflected in the number of revenue passengers might be captured by other measures of transit output. Revenue passenger-miles, for example, would make a superior output index since it would measure changes in average trip length as well as in the number of transit trips taken. Unfortunately, data on transit passenger-miles are generally not available.

Data are available, however, on the number of vehicle-miles operated and for some purposes this may be a more appropriate measure of output than revenue passengers. Vehicle-miles capture at least some of the reduction in crowding as well as most of the increase in trip lengths but do not reflect the deterioration in schedules, the increase in crime, or improvements in amenities such as air-conditioning.

Details of vehicle miles operated by the transit industry are shown in Table 6. These data, however, cannot be accepted uncritically. As Table 6 shows, the number of vehicle miles operated on each transit mode declined much less rapidly than the number of revenue passengers

TABLE 5

TRENDS IN INPUTS USED BY THE TRANSIT INDUSTRY 1948-70

	Index (1958 = 100.0)					Average Annual Percentage Change 1948-70
	1948	1955	1960	1965	1970	
Labor Inputs	171.0	122.1	94.6	87.0	82.6	-3.48
Capital Inputs	153.5	109.3	93.4	79.5	76.0	-2.97
Intermediate Goods (Operating & Maintenance Materials)	146.8	102.9	98.4	90.5	105.6	-1.63
Total Factor Inputs	160.7	114.4	94.5	84.0	82.1	-3.15
Capital/Labor Ratio	89.8	89.5	98.7	91.4	92.0	+0.52

SOURCE: Meyer and Gomez-Ibanez

TABLE 6

TRENDS IN NUMBER OF REVENUE PASSENGERS CARRIED
AND VEHICLE MILES OPERATED 1948-70

	Index (1958 = 100.0)					Average Annual % Change 1948-70	% of all Transit Modes 1970
	1948	1955	1960	1965	1970		
Revenue Passengers							
Heavy Rail Transit	151.3	104.8	102.1	102.6	96.2	- 2.13	26.1
Light Rail Transit	1142.2	203.6	80.7	49.2	41.4	-14.61	2.9
Trolley Bus	203.4	146.5	75.4	31.4	21.4	-10.17	2.1
Motor Bus	173.2	111.7	98.7	92.1	81.0	- 3.55	<u>68.9</u>
All Transit Modes	222.6	118.1	96.7	87.4	77.6	- 4.89	100.0
Vehicle Miles							
Heavy Rails	118.5	99.0	101.1	102.3	105.3	- 0.56	21.6
Light Rail Transit	777.9	198.3	83.2	46.3	37.5	-13.45	1.8
Trolley Bus	135.9	134.7	76.9	32.8	25.2	- 7.71	1.8
Motor Bus	124.0	107.3	98.9	95.9	88.4	- 1.60	<u>74.8</u>
All Transit Modes	150.4	111.2	97.4	91.2	85.6	- 2.65	100.0

SOURCE: Meyer and Gomez-Ibanez

carried. The increase in vehicle-miles operated per passenger carried may reflect route preferences or demand for longer trips and less crowding. It may represent other trends as well. In particular, maintaining the number of vehicle-miles in the face of declining patronage may have been perceived as important to achieving certain public or social objectives. As widespread public regulation and subsidization of the industry suggest, other dimensions of transit output besides passengers carried may be important to society. Perhaps the most important of these other dimensions is the maintenance of some "minimum" network and schedule of transit service for the local community. As the fortunes of the transit industry have declined, a key motivation for local public takeover and subsidization of transit in many cities has been concern for preserving at least some of this service, especially services to downtown retail areas or for those residents who do not have ready access to automobiles because they are too old, young or physically-disabled to drive or too poor to own a car.

If the number of vehicle miles declines more slowly than patronage because of publicly-mandated social policy rather than passenger willingness to pay for the retained or mandated service, then a transit output index based on vehicle miles alone could exaggerate the output, and its quality, to passengers. Such an output index should perhaps best be viewed as an upper boundary for any estimate of the growth in services provided to passengers, just as an output index based on revenue passengers points to a lower boundary.

Further, vehicle miles might be an appropriate index of the social outputs produced by transit in addition to its services to passengers. Since the stability of vehicle mileage is a product of both passenger demands for improved services and publicly-mandated policies to maintain minimum levels of service despite declining patronage, vehicle miles might measure both the passenger and social outputs.

The degree of meaning attached to any index depends, of course, on whether maintaining transit vehicle-mileage provides significant public benefits. It is doubtful that maintaining unprofitable transit service is an effective means of advancing the social objectives claimed by proponents of transit subsidy.

The choice between revenue passengers and vehicle miles does make a significant difference when estimating transit output trends. Table 7 shows two indices of transit output from 1948 to 1970, one based on passengers and the other on vehicle miles. Output as measured by revenue passengers declines at an average annual rate of 4.42%; output measured in vehicle miles at only 3.44%. The changes in the various factors can also be derived from the tabulation.

The trends are not likely to bring glad tidings to the managers of transit enterprises. Transit labor productivity has been declining through 1970 and, in view of large wage increases since that date, can be expected to have declined even further thereby intensifying the effects of inflation on transit operations.

TABLE 7

EFFECT OF USING REVENUE PASSENGERS OR VEHICLE MILES
AS BASIC MEASURE OF TRANSIT OUTPUT

<u>Index (1958 - 100.0) and Trend</u>	<u>If Output Index Based on Revenue Passengers</u>	<u>If Output Index Based on Vehicle Miles</u>
<u>Output</u>		
Index: 1948	228.6	171.8
1955	118.8	114.5
1960	96.5	96.5
1965	86.0	88.7
1970	77.1	83.2
Average Annual Percentage Change, 1948-70	-4.42	-3.32
<u>Total Factor Productivity</u>		
Index: 1948	142.3	106.9
1955	103.8	100.1
1960	102.1	102.1
1965	103.5	105.6
1970	93.9	101.3
Average Annual Percentage Change, 1948-70	-1.40	-0.11
<u>Labor Productivity</u>		
Index: 1948	133.7	100.5
1955	97.3	93.8
1960	102.0	102.0
1965	99.9	102.0
1970	93.3	100.7
Average Annual Percentage Change, 1948-70	-0.93	+0.35
<u>Capital Productivity</u>		
Index: 1948	148.9	111.9
1955	108.7	104.8
1960	103.3	103.3
1965	109.3	111.6
1970	101.4	109.5
Average Annual Percentage Change, 1948-70	-1.45	-0.14

SOURCE: Meyer and Gomez-Ibanez

IV. INFLATIONARY OUTLOOK

It is difficult to believe that inflation will modify very much during the next five years. Because of its exposure to transit wage demands, the District is vulnerable in terms of higher compensation packages for employees.

Some evidence has been presented to show that trade unions are increasingly "building-in" inflationary components into their wage bargaining and society is now so structured that inflation seems to be a permanent feature. There is an apparent "floor" to annual inflation which may be as high as 5%.

There are many factors at work to suggest that the average inflationary increase, on an annual basis during the next five years may conservatively lie between 5% and 7%. This statement is true irrespective of whether the analysis is directed to wholesale prices, the consumer price index or transit labor nomination.

Wholesale prices increased 72% between 1969 and 1976 and in 1977 the trend is still upward. It is noteworthy that one of the categories in this index, crude materials, increased 126% during this period and rose 41% between 1973 and 1974. It does not need any great imagination to realize that most of this increase was due to higher prices for oil and other energy products. It seems most unlikely that cheap energy will ever again be available to the U.S.

The consumer price index also seems likely to increase in order to reflect changes in key components. Even if an assumption is made that normal weather will prevail and food prices will not be affected as before, pressure will continue on energy, housing, transportation and household services. Energy costs alone, to the consumer seem likely to increase at a rate of 10% to 11% annually for the next two years and may be more if President Carter's energy program has a significant effect. One commodity which does seem certain to increase significantly in price is natural gas, it can be expected that exploration incentives will be introduced and these will have a significant effect on prices paid by consumers.

Demand for higher wages will continue and the District must face this. One eminent economics groups has suggested that the average increase in wages during the next 2 years may range between 6% and 8% and points out that during the past 2 years, although wages increased by 7-1/2% to 8% annually, increases in fringe benefits added 3% to that figure. Given the points that have been made earlier, when discussing the economies of inflation, it is unlikely that wage increases will show any leveling out.

The wage problem in the transit industry seems likely to become even more of a problem. The constant demands of transit unions for additional wage increases and higher fringe benefits will undoubtedly persist. Some very skillful labor negotiations will be needed to keep

this trend in check.

A report from the "San Francisco Examiner" of May 31, 1977 emphasizes the problems of inflation in the years ahead:

"...Inflation is worse than expected and no one seems to know what can be done about it.

Two villains, food and fuel, are expected to push up prices by about 6.5% this year, most economists agree. The pessimists say the inflation rate will be 7% or more.

This means that rising prices will know another 65¢ or 70¢ off the buying power of a \$10 bill in 1977, on top of a loss of 50¢ last year.

Only a few months ago, White House advisors to President Carter were forecasting a 1977 price rise of 5.5% to 6%. Since the first of the year, however, the inflation outlook has become gloomier.

The government's consumer price index has climbed at an annual, double-digit rate of 10% from January through April. Food prices, affected in part by the frigid winter, have skyrocketed at a 17% rate in the last three months.

Most forecasters believe that food prices will taper off in the coming months and help to lower the rise in the price index. The rate of inflation in the last half of the year is not likely to be anywhere near as bad as it was in the first half, said a White House economist. Robert Crandall, Chairman of the Council on Wage-Price Stability, thinks food will show a hefty increase of 8% in the remaining months of 1977. His forecast for inflation this year: 7% and maybe slightly over that, depending on the food sector.

William Cox, an economist for the Joint Economic Committee, said that energy costs almost certainly will rise, whether Congress acts on Carter's energy program or not.

The President has said that adoption of his entire package would increase the annual inflation rate by 4/10 of 1%, or by 7/10 of 1% if his proposed standby gasoline tax were triggered.

The behavior of industrial prices, Cox said, has been inexplicable since they have not fallen

as expected with the economy recovery this spring.

In additon, he said, a 6% increase in major steel products on June 19 is sure to have an impact on consumer prices later this year.

Finally, the Federal Reserve Board has been gradually restricting the growth of the money supply, a move that ordinarily raises interest rates. An increase in short-term interest rates is occurring and some rise in long-term credit costs also is expected.

An inflation rate from 6% to 8% is certainly possible, said Cox..."

V. SUMMARY AND CONCLUSION

Based on what has been presented in this Appendix, it seems that an annual average inflation rate of 6% is probably conservative. The rate may be closer to 7% or even slightly higher. General agreement among economists now seems to be that the inflation floor is probably 5% annually. Thus, the objective of the Administration will probably be to keep the annual rate as close to 5% as possible, but it seems unlikely that the optimum will be reached.

The projections made in Appendix A thus appear to have a high level of validity, particularly those associated with a 6% annual rate of inflation. The analysis in Appendix A showed that, with a 6% per annum inflation and existing tolls and fares, a 21% reduction in transit service in Fiscal Year 1977/78 would be necessary in order to match revenues and costs. As stated, this is probably conservative, the actual reductions based on a higher inflation rate may be even more drastic.



GOLDEN GATE BRIDGE, HIGHWAY AND TRANSPORTATION DISTRICT

DALE W. LUEHRING
GENERAL MANAGER

April 7, 1977

Board of Directors
Golden Gate Bridge, Highway
and Transportation District

RE: INITIAL ENVIRONMENTAL STUDY
OF PROPOSED TOLL AND FARE INCREASES

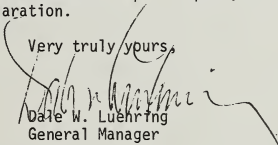
Dear Honorable Members:

The following study constitutes the "Initial Environmental Study" relevant to the District's proposed toll and fare increases pursuant to the requirements of the California Environmental Quality Act of 1970, as amended.

The study follows the subject content for an Initial Study as suggested by the amended Guidelines for Environmental Impact Reports issued by the California State Resources Agency, effective January 1, 1977.

The study documents existing knowledge and certain preliminary analyses relevant to the decision to make the proposed toll and fare increases the subject of an Environmental Impact Report, or alternatively a Negative Declaration.

Very truly yours,


Dale W. Luehring
General Manager

DWL/ca
Attachment

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1.0 DESCRIPTION OF THE PROPOSED PROJECT

The Golden Gate Bridge, Highway and Transportation District operates the Golden Gate Bridge as a toll bridge, operates ferry transit services between Marin County and San Francisco, and operates bus transit services on routes within and between San Francisco and Marin and Sonoma Counties. The level of bus transit fares for trips extending beyond either Marin or Sonoma Counties, the level of ferry transit fares, and bridge tolls are determined by the District.

The District proposes to increase the bridge toll for automobiles* together with an increase in fares for transit services between San Francisco and Marin and Sonoma Counties, effective July 1, 1977. The toll and fare increases are intended to generate revenue to provide the necessary reserves for repair of the bridge as well as to cover operating expenses without reducing the level of transit service provided.

1.1 Existing Tolls and Fares

1.1.1 Tolls

Bridge tolls are paid by vehicles passing in the southbound direction only. The present toll for automobiles is \$0.75 per vehicle.

Convenience books of 20 tickets, each good for a single passage at any time during a given four-month period, are sold at face value during the first two months of each four-month period. Carpools (vehicles occupied by 3 or more persons) are permitted free passage during specified hours, Monday through Friday.

The existing toll charges for all categories of vehicles are shown in Table 1.

*For definition of the toll category "automobiles" see Table 1.

TABLE 1
EXISTING AND PROPOSED TOLL SCHEDULES

<u>CLASSIFICATION</u>	<u>CURRENT TOLL</u>	<u>PROPOSED TOLL</u>
Auto, ambulance, hearse, motorcycle, tricar, or truck with single rear wheels, recreational vehicle	\$0.75	\$1.00*
Convenience Book (20 tickets) (no discount)	15.00	16.00* (20% discount)
Automobile or truck with trailer	1.50	1.50
2-axle truck with dual rear wheels	1.50	1.50
3-axle vehicle	3.00	3.00
4-axle vehicle	4.50	4.50
5-axle vehicle	6.00	6.00
6-axle vehicle	7.50	7.50
7-axle vehicle	9.00	9.00
8-axle vehicle	10.50	10.50
9-axle vehicle	12.00	12.00
Bus (15 or more occupants including driver)	2.00	2.00
Commuter bus	.10	.10
District vehicles, employees, directors, CHP, club buses	FREE	FREE
Extra axles	"	"
Military vehicles	"	"
Toll-free carpool vehicles (3 or more/6-10 A.M.)	"	"

*INDICATES CHANGE

1.1.2 Transit Fares

Bus fares are paid in cash when boarding or leaving and exact fare is required. Passenger transfer between certain bus routes and at certain points is permitted, without additional charge, by use of a transfer ticket.

Ferry fares are paid in cash at ticket desks at the ferry terminals and on board the M. V. Golden Gate, which operates between San Francisco and Sausalito. The existing one-way ferry fare from Sausalito to San Francisco is \$0.75; from Larkspur to San Francisco the fare is \$1.00.

Convenience books of 20 tickets are sold at face value and are accepted in lieu of cash fares on both buses and ferries for all trips to or from San Francisco.

Discount fares (set at approximately half the full fare) are offered to students, senior citizens and the handicapped on all but commuter services.⁽¹⁾ Children under five years of age accompanied by an adult and all blind persons are carried free of charge on all services.

The existing fare zones are shown in Figure 1. The existing fares are shown on Table 2.

1.2 Proposed Toll and Fare Schedule

The District is considering several alternative "mixes" of toll and fare increases as well as the possibility of not increasing either tolls or fares. In October 1976, the Board of Directors authorized the staff to,

"prepare supporting data for preliminary environmental analysis, based on the Five-Year Projections as submitted by the Auditor-Controller and General Manager, and that the toll and fare increases be analyzed on the bases of:

⁽¹⁾ Commute service is defined as the service of 20 specific bus routes operating between Marin and Sonoma County neighborhoods and the San Francisco Financial District or Civic Center during the commute periods, Monday thru Friday only, with service being to San Francisco only in the morning and from San Francisco only in the evening commute periods.

FIGURE 1
EXISTING FARE ZONES

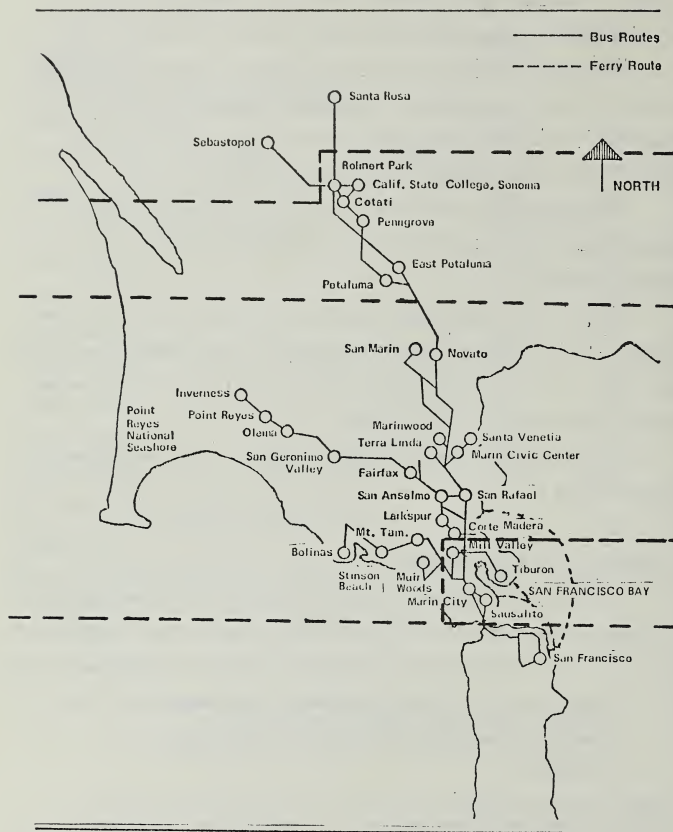


TABLE 2

EXISTING AND PROPOSED TRANSIT FARE SCHEDULES

A. EXISTING FARE SCHEDULE: Adult/Discount

<u>ZONE</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
1	.35/a					
2	.75/.35	.35/a				
3	1.00/.50	.35/.15	.35/a			
4	1.25/.60	.50/.25	.50/.25	.35/a		
5	1.50/.75	.75/.35	.75/.35	.35/a	.35/a	

B. PROPOSED FARE SCHEDULE: Adult/Discount

<u>ZONE</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
1	.50/.25					
2	1.00/.50	.35/a				
3	1.25/.60	.35/a	.35/a			
4	1.50/.75	.35/a	.35/a			
5	2.00/1.00	1.25/.60	1.00/.50	.75/.35	.35/a	
6	2.25/1.10	1.50/.75	1.25/.60	1.00/.50	.35/a	.35/a

NOTE: Books of 20 tickets acceptable on all schedules to and from San Francisco, available at 20% discount below adult fare.

Sausalito Ferry (between Zones 1 and 2) cash fare \$1.25 on Saturdays, Sundays and Holidays.

C. DISCOUNTS: Applicable to both existing and proposed schedules:

(a) Discount fares within Marin and within Sonoma County:

Students .25
Seniors & Handicapped .15

The discount fare applies to:

Student - age 6 through 21 with school I.D.

Seniors - age 65 or over with Bay Region Transit Discount Card or Medicare Card

Handicapped - with Bay Region Transit Discount Card

The discount fare applies on:

All Local Routes - buses operating entirely within Marin County (Routes 1, 21, 23, 27, 33, 35, 39, 41, 43, 45, 47, 49)

All Basic Routes - buses operating all day long, seven days a week (Routes 10, 20, 50, 70 and 80) and recreation (Routes 61, 63, 64)

Children ages 5 and under ride free (limit of 2 children per accompanying adult)

Blind persons with Bay Region Transit Discount Card (stamped "Blind") or Golden Gate Transit I.D. card ride free on all routes.

- (a) no toll or fare increases;
- (b) a 10% to 20% discount; and
- (c) combinations thereof for years beginning July 1, 1977 and July 1, 1978..."

A variety of toll and fare increase combinations, with varying discount levels, have been investigated. The Board has indicated no preference for any one of these various alternatives. However, for purposes of clarity and organization of this document, the staff has characterized the following policy as the "Proposed Action". (Other policies investigated have been characterized as alternatives to the proposed action.)

The Proposed Action consists of:

(a) An increase in automobile tolls by \$0.25. The arrangements permitting certain government vehicles and commuter carpools to pass toll free would be retained. The toll structure for vehicles other than automobiles would be unchanged.

(b) An increase in the fare for the Larkspur ferries by \$0.25, and an increase by \$0.25 for the Sausalito ferry on weekdays; \$0.50 on weekends and holidays.

(c) An increase in bus transit intercounty fares by \$0.25 and, in addition, a division of the existing Zone 3 (covering central and northern Marin County) into two zones. The result of this zone division is to increase the cost of intercounty trips to and beyond northern Marin by an additional \$0.25.

(d) A re-definition of Zones 2 and 3 (covering Southern Marin County) such that the Tiburon Peninsula is made a part of Zone 3.

The proposed Fare Zones are shown in Figure 2.

1.3 Alternatives to the Proposed Action

The District has investigated the revenue and environmental consequences

FIGURE 2

PROPOSED FARE ZONES



6

5

4

3

2

1

of several alternatives to the fare/toll increase characterized as the Proposed Action. Those which have, to date, received the most detailed scrutiny and which are addressed in this document are:

(a) Continuation of the existing toll and fare structure.

(b) A \$0.25 increase in auto tolls, the creation of six fare zones with a \$2.25 maximum fare but with a 20% discount on transit fares only available through a ticket purchase program.

(c) A \$0.25 increase in auto tolls, the creation of six fare zones with a \$2.25 maximum fare but with a 20% discount on both transit fares and tolls available through a ticket purchase program.

(d) A \$0.25 increase in auto tolls, the creation of six fare zones with a \$2.00 maximum fare and with a 10% discount on transit fares only available through a ticket purchase program.

(e) A \$0.25 increase in auto tolls, creation of six fare zones with a \$2.25 maximum fare with a 10% discount on both transit fares and tolls available through a ticket purchase program.

2.0 ENVIRONMENTAL SETTING

While vehicles crossing the Golden Gate Bridge originate from and are destined for all parts of the North American Continent, there is generally a greater use of the facility by vehicles originating from points of closer proximity. The most recent survey of users by place of vehicle registration is shown in Table 3.

Two highways provide the principal connection between San Francisco and the coastal regions of California's northern counties. California State Route 1 closely follows the Pacific coastline from southern California, along the San Francisco Peninsula, across the Golden Gate Bridge and northward along the coastline to Oregon. U.S. Route 101 follows the most populated valleys within the Coastal Range from southern California, then along the western shores of San Francisco Bay to cross the Golden Gate Bridge and continue along the western Bay shore and the valleys of the Coastal Range, to join State Route 1 some 160 miles north of San Francisco. With the opening of the Golden Gate Bridge in 1937, these routes rapidly became the principal connections between San Francisco and the timber, wine, agricultural and recreational industries of the northern counties, displacing the railroads and their connecting ferry services. A branch rail freight service* currently operates north of San Rafael.

The State's principal north-south highway, Interstate Route 5, is located along the San Joaquin Valley, east of the San Francisco Bay Area. The principal route eastward from the San Francisco Bay Area, Interstate Route 80, is located along the eastern bay shores. The most direct connections to these routes from the Bay Area's major population areas do not cross the Golden Gate Bridge.

*The service, in a number of locations, is currently the subject of abandonment petitions.

TABLE 3
DISTRIBUTION OF GOLDEN GATE BRIDGE USERS
BY COUNTY OF VEHICLE REGISTRATION

	<u>Marin</u>	<u>S.F.</u>	<u>San Mateo</u>	<u>Sonoma</u>	<u>Other Calif.</u>	<u>Out of State</u>	<u>Total</u>
Commute 6-10 A.M.	65.0	10.9	4.0	6.9	9.1	4.1	100
Weekday	46.5	16.9	7.8	7.4	15.0	6.4	100
Saturday	29.9	23.7	9.9	7.9	20.7	7.9	100
Sunday	24.6	26.1	14.3	4.5	22.2	8.3	100
Overall	41.6	19.0	8.8	7.1	16.7	6.8	100

SOURCE: CALTRANS License Plate Survey of Southbound Auto Traffic-October, 1975

NOTES:

- (1) Results of a week-long survey conducted in March, 1977 will be available by May, 1977.
- (2) To the extent that some vehicles may be registered through a place of employment, or through a lessor, some overstatement of the number of users "residing" at principal employment centers is anticipated.

The location of major agricultural and recreational areas north of the Golden Gate Bridge is shown in Figure 3.

The San Pablo and San Francisco Bays together form a contiguous body of tidal water some 50 miles long and variously four to twelve miles wide, with its longer axis paralleling the Pacific coastline. The bays receive the flows of the Sacramento River, from the northeast, and various lesser waterways, and open to the Pacific Ocean at the mile-wide, 350-foot deep Golden Gate Straits.

The principal cities of the Bay Area's nine-county Region are San Francisco, Oakland and San Jose. Seventy percent of the Region's 4.6 million population is located on the Bay Plain lands which adjoin the Bay shoreline. The greatest concentration of population is on these lands along the West Bay between San Francisco and San Jose and along the East Bay between San Jose, Oakland and Vallejo.

The Bay Area climate frequently develops the atmospheric conditions in which an "inversion layer" restrains the upward migration of the body of air containing pollutants. The hills bordering the east and west of the bay restrain the horizontal migration of this air. Strong sunlight, acting on the nitrogen oxide pollutants, create the conditions of photochemical smog.

The northwestern quadrant of the Bay is the least populated. The population of Marin County is 220,000; that of Sonoma County is 233,000.

The Bay Area Rapid Transit District (BART) and AC Transit bus services provide public transportation services in the East Bay Corridor, and connections between the East Bay and San Francisco. The Southern Pacific Railroad, the San Mateo County Transit District, the Santa Clara County Transit District, and other bus operators, provide public transportation in the West Bay Corridor south of San Francisco. The Golden

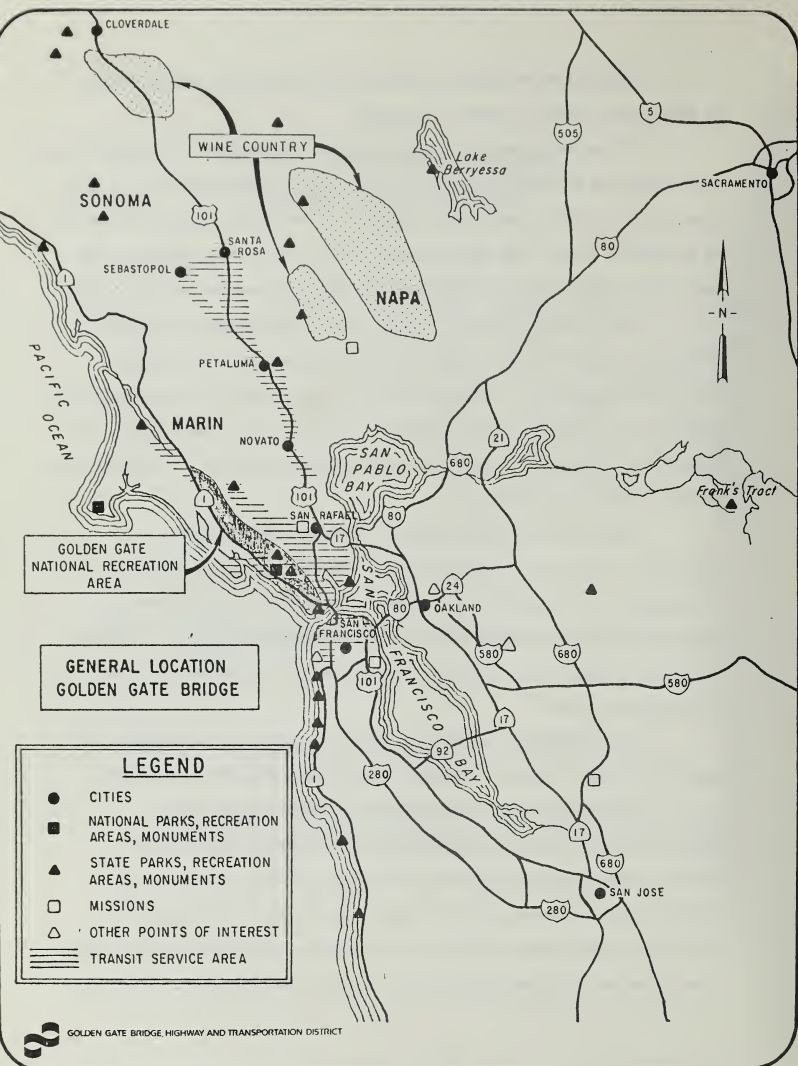
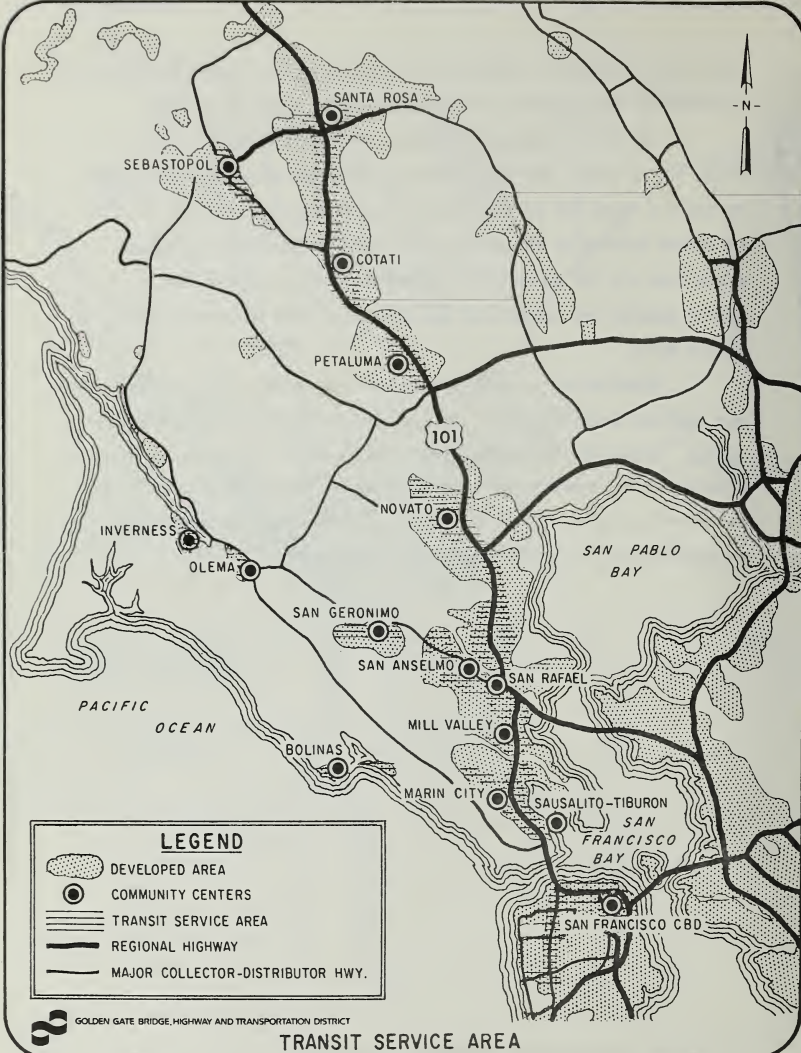


FIGURE 3

Gate Bridge, Highway and Transportation District provides public transportation in the Golden Gate Corridor along the northwestern shores of the Bay.

The Service area of the Golden Gate Transit system is shown in Figure 4. It extends from San Francisco, across the Golden Gate Bridge and follows U.S. Route 101 connecting the principal population centers of Marin and Sonoma Counties as far north as Santa Rosa and Sebastopol. Branches extend from U.S. 101 along the more populated valleys of Marin County. Special commuter and recreational bus services operate in the rural areas of West Marin.

Urbanization in Southern and Central Marin has, with few exceptions, been confined to the flat lands adjoining the bay shore, and the connecting valleys. Extensive plain lands exist in Northern Marin and Sonoma Counties, but urbanization has been limited to the areas around the established cities, and is not contiguous. Thus, the pattern of development is characterized by the existence of physically discrete communities.



GOLDEN GATE BRIDGE, HIGHWAY AND TRANSPORTATION DISTRICT

TRANSIT SERVICE AREA

FIGURE 4

3.0 IDENTIFICATION OF ENVIRONMENTAL EFFECTS

The existence or possibility of impacts on various aspects of the environment are indicated in Table 4

3.1 Traffic and Transportation

3.1.1 Existing Trends

Historic trends in automobile and transit travel volumes in the Golden Gate Corridor are illustrated in Figure 5. Auto traffic increased at approximately 4.0% per annum between 1950 and 1970, then remained approximately constant from 1970 to 1975. In 1976, growth appears to have resumed. Transit patronage increased by nearly 50% in 1972 when the District took over the former Greyhound commuter service in Marin and Sonoma Counties. Though approximately constant prior to the takeover, commuter transit patronage has since grown steadily. The trend was interrupted by a nine-week strike of bus drivers in the Spring of 1976.

The history of Golden Gate Bridge auto tolls and Golden Gate bus and ferry transit fares is shown in Figure 6. Following a series of toll reductions prior to 1956, auto tolls were held at 25 cents in each direction until the District on October 19, 1968 changed to a 50¢ toll collected in the southbound direction only. In its only toll increase since 1939, the District, in March of 1974, raised auto tolls from 50¢ to 75¢ collected in the southbound direction only.

Various commuter discount schemes have been in effect during the Bridge's history.

Because the toll increase of 1974 occurred at the height of the national gasoline shortage, and the abrupt rise in gasoline prices

TABLE 4 CONTINUED)

SUMMARY OF POTENTIAL ENVIRONMENTAL EFFECTS

	YES	MAYBE	NO		YES	MAYBE	NO
7. Light and Glare. Will the proposal produce new light or glare?	—	—	X	16. Utilities. Will the proposal result in a need for new systems, or substantial alterations to the following utilities:	—	—	X
8. Land Use. Will the proposal result in a substantial alteration of the present or planned land use of an area?	—	—	X	a. Power or natural gas?	—	—	X
9. Natural Resources. Will the proposal result in:	—	—	—	b. Communications systems?	—	—	X
a. Increase in the rate of use of any natural resources?	X	—	—	c. Water?	—	—	X
b. Substantial depletion of any nonrenewable natural resource?	—	—	—	d. Sewer or septic tanks?	—	—	X
10. Risk of Upset. Does the proposal involve a risk of an explosion or the release of hazardous substances (including, but not limited to, oil, pesticides, chemicals or radiation) in the event of an accident or upset conditions?	—	—	X	e. Storm water drainage?	—	—	X
11. Population. Will the proposal alter the location, distribution, density, or growth rate of the human population of an area?	—	—	—	f. Solid waste and disposal?	—	—	—
12. Housing. Will the proposal affect existing housing, or create a demand for additional housing?	—	—	—	17. Human Health. Will the proposal result in:	—	—	X
13. Transportation/Circulation. Will the proposal result in:	—	—	X	a. Creation of any health hazard or potential health hazard (excluding mental health)?	—	—	X
a. Generation of substantial additional vehicular movement?	—	X	—	b. Exposure of people to potential health hazards?	—	—	—
b. Effects on existing parking facilities, or demand for new parking?	—	X	—	18. Aesthetics. Will the proposal result in the obstruction of any scenic vista or view open to the public, or will the proposal result in the creation of an aesthetically offensive site open to public view?	—	—	X
c. Substantial impact upon existing transportation systems?	—	X	—	19. Recreation. Will the proposal result in an impact upon the quality or quantity of existing recreational opportunities?	—	—	X
d. Alterations to present patterns of circulation or movement of people and/or goods?	—	—	—	20. Archeological/Historical. Will the proposal result in an alteration of a significant archeological or historical site, structure, object or building?	—	—	—
e. Alterations to waterborne, rail or air traffic?	—	—	—	21. Mandatory Findings of Significance.	—	—	X
f. Increase in traffic hazards to motor vehicles, bicyclists or pedestrians?	—	—	X	(a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	—	—	X
14. Public Services. Will the proposal have an effect upon, or result in a need for new or altered governmental services in any of the following areas:	—	—	X	b. Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one which occurs in a relatively brief, definitive period of time while long-term impacts will endure well into the future.)	—	—	—
a. Fire protection?	—	—	X	c. Does the project have impacts which are individually limited, but cumulatively considerable? (A project may impact on two or more separate resources where the impact on each resource is relatively small, but where the effect of the total of those impacts on the environment is significant.)	—	—	X
b. Police protection?	—	—	X	d. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	—	—	—
c. Schools?	—	—	X				
d. Parks or other recreational facilities?	—	—	X				
e. Maintenance of public facilities, including roads?	—	—	X				
f. Other governmental services?	—	—	X				
15. Energy. Will the proposal result in:	—	—	—				
a. Use of substantial amounts of fuel or energy?	X	—	—				
b. Substantial increase in demand upon existing sources of energy, or require the development of new sources of energy?	X	—	—				

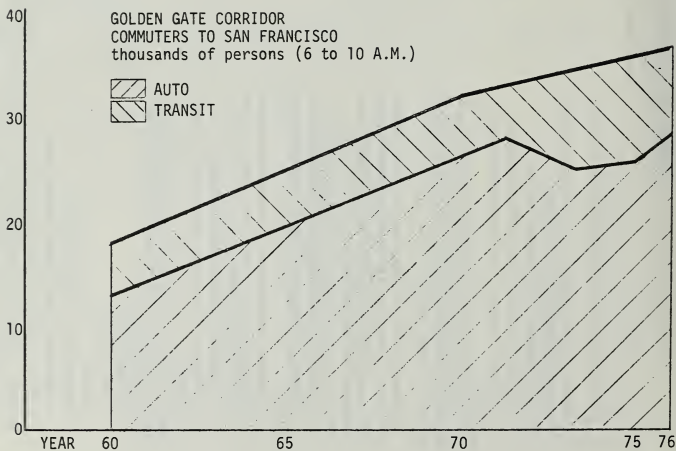
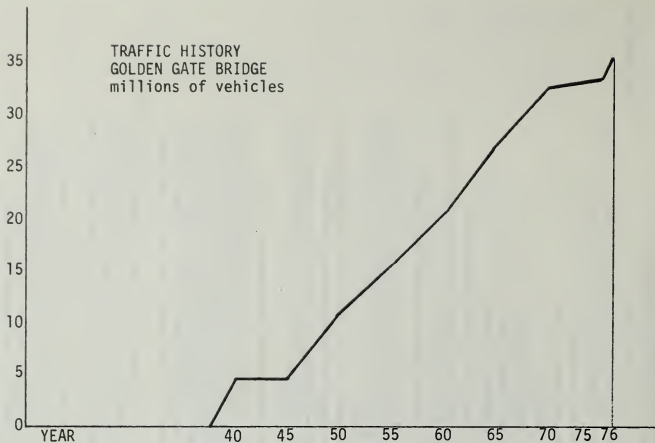
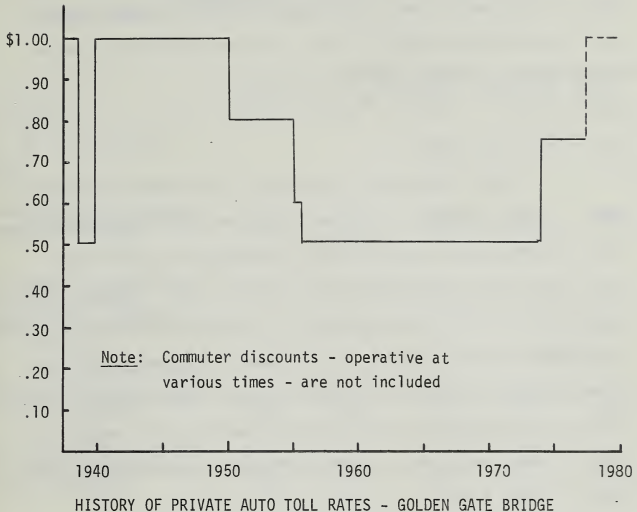


FIGURE 5
TRAFFIC AND TRANSIT GROWTH



HISTORY OF TRANSIT FARES - GOLDEN GATE FERRY AND BUS SERVICES

Sausalito Ferry fares were increased from 50¢ to 75¢, each direction, on May 1, 1972 to achieve compatibility with bus fares.

Otherwise, since the beginning of Golden Gate Ferry services in August, 1970, and Golden Gate Transit bus services on January 1, 1971, there has been no change to the adult fares charged for intercounty transit trips. There have been various changes to the set of discount fares. On July 15, 1974, Marin County local fares were increased from 25¢ to 35¢

FIGURE 6

TRENDS IN GOLDEN GATE BRIDGE TOLLS AND TRANSIT FARES

experienced during 1973 and 1974, it is not possible to determine the effect of that toll increase on automobile traffic. Studies by MTC staff have concluded that it is likely that the toll increase had no lasting effect on traffic volumes (Reference 5).

3.1.2 Short-Term Impacts

In 1975, consultants to the District developed a computerized model to relate changes in tolls and fares (and other determinants of travel volume) to the relative levels of automobile, bus and ferry travel within the Golden Gate Corridor (Reference 4). The model was recalibrated in 1977 by the consultant. That model, with further adjustments recommended by District staff, has been used to estimate the effects of the proposed toll and fare increases on the relative levels of auto traffic and bus and ferry patronage. The results of this analysis in terms of annual and commute period traffic and transit patronage are shown in Tables 5 and 6.

3.1.3 Long-Term Travel Impacts

By providing the revenue base to maintain the District's transit system as planned and developed, the proposed increases will help to provide a long-term transit option in the Golden Gate Corridor.

Figure 7 shows the history of Golden Gate Bridge toll rates for private automobiles, adjusted by the Consumer Price Index to show the effect of inflation. Until the increase of 1974, toll charges gradually reduced relative to the cost of other goods and services and to incomes. It is generally believed that this reduction would have served to encourage growth in corridor auto traffic. The severe inflation of 1974, 1975 and 1976 has already cancelled some of the effect of the toll increase of

TABLE 5

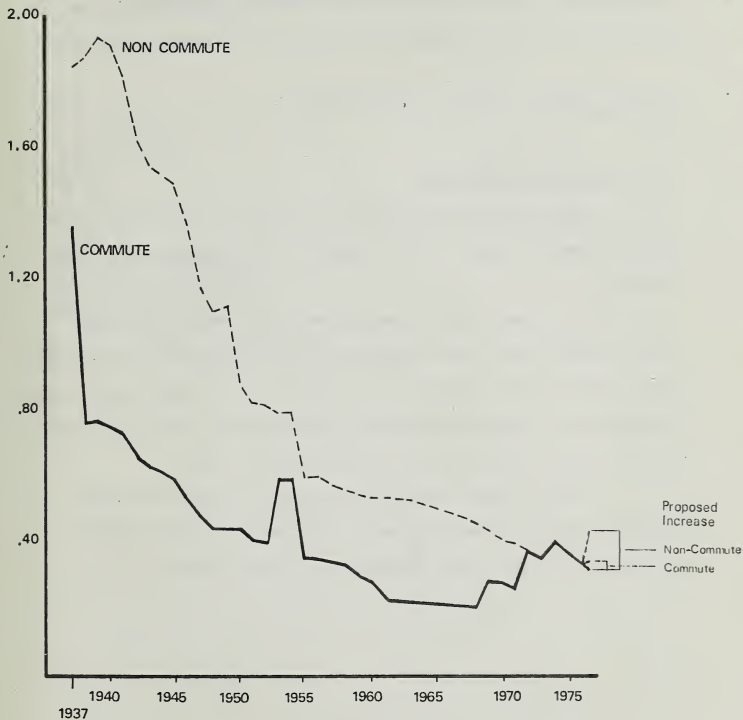
TRANSBAY TRAFFIC & PATRONAGE WITH TOLL AND FARE ALTERNATIVES
EFFECTIVE JULY 1, 1977

ALTERNATIVES	MILLIONS OF AUTOS, MILLION OF RIDERS PER YEAR - FOR FISCAL YEARS					
	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82
1. EXISTING TOLLS & FARES WITH HYPOTHETICAL CONTINUATION OF TRANSIT						
Vehicles Crossing Bridge	35.2	35.9	36.6	37.6	38.3	39.1
Transit Passengers	7.8	9.2	9.4	9.6	9.8	10.1
 \$1.00 AUTO TOLL; 6 FARE ZONES WITH \$2.25 MAXIMUM FARE; AND THE FOLLOWING ALTERNATIVE DISCOUNT PROVISIONS						
2. 20% on Fares, None on Tolls						
Vehicles Crossing Bridge	35.2	36.1	36.9	37.8	38.6	39.4
Transit Passengers	7.8	8.8	9.0	9.2	9.4	9.6
3. 20% on Fares, 20% on Tolls						
Vehicles Crossing Bridge	35.2	36.2	37.0	38.0	38.7	39.6
Transit Passengers	7.8	8.7	8.8	9.1	9.3	9.5
4. \$1.00 AUTO TOLL; 6 FARE ZONES WITH \$2.00 MAXIMUM FARE; AND A DISCOUNT OF 10% Fares, None on Tolls						
Vehicles Crossing Bridge	35.2	36.2	37.0	37.9	38.7	39.6
Transit Passengers	7.8	8.6	8.8	9.0	9.2	9.4
5. \$1.00 AUTO TOLL; 6 FARE ZONES WITH \$2.25 MAXIMUM FARE; AND A DISCOUNT OF 10% on Fares, 10% on Tolls						
Vehicles Crossing Bridge	35.2	36.3	37.1	38.1	38.8	39.7
Transit Passengers	7.8	8.5	8.7	8.9	9.1	9.3
6. EXISTING TOLLS AND FARES WITH ALL TRANSIT DISCONTINUED JULY 1, 1978						
Vehicles Crossing Bridge	35.2	35.9	41.1	42.1	43.0	44.0
Transit Passengers	7.8	9.2	-	-	-	-

TABLE 6

MORNING COMMUTE PERIOD (6 to 10 A.M. SOUTHBOUND)
 TRAFFIC AND PATRONAGE WITH TOLL AND FARE ALTERNATIVES
 EFFECTIVE JULY 1, 1977

Alternative	THOUSANDS OF VEHICLES, THOUSANDS OF RIDERS PER TYPICAL MORNING COMMUTE PERIOD FOR FISCAL YEARS					
	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82
EXISTING TOLL AND FARES WITH HYPOTHETICAL CONTINUATION OF TRANSIT						
Vehicles Crossing Bridge	21.0	21.4	21.9	22.3	22.8	23.3
Transbay Transit Passengers	10.4	11.7	12.0	12.3	12.5	12.8
\$1.00 AUTO TOLL; 6 FARE ZONES WITH \$2.25 MAXIMUM FARE; AND THE FOLLOWING ALTERNATIVE DIS- COUNT PROVISIONS:						
20% ON FARES, NONE ON TOLLS						
Vehicles Crossing Bridge	21.0	21.6	22.0	22.5	23.0	23.5
Transbay Transit Passengers	10.4	11.3	11.7	11.9	12.2	12.6
20% ON FARES; 20% ON TOLLS						
Vehicles Crossing Bridge	21.0	21.7	22.2	22.7	23.2	23.6
Transbay Transit Passengers	10.4	11.1	11.3	11.6	11.8	12.1
\$1.00 AUTO TOLL; 6 FARE ZONES WITH \$2.00 MAXIMUM FARE; AND A DISCOUNT OF 10% ON FARES, NONE ON TOLLS						
Vehicles Crossing Bridge	21.0	21.8	22.2	22.7	23.2	23.7
Transbay Transit Passengers	10.4	11.0	11.2	11.4	11.7	11.9
\$1.00 AUTO TOLL; 6 FARE ZONES WITH \$2.25 MAXIMUM FARE; AND A DISCOUNT OF 10% ON FARES, 10% ON TOLLS						
Vehicles Crossing Bridge	21.0	21.9	22.3	22.8	23.3	23.8
Transbay Transit Passengers	10.4	10.7	11.0	11.2	11.4	11.7
EXISTING TOLLS AND FARES WITH ALL TRANSIT DISCONTINUED JULY 1, 1978						
Vehicles Crossing Bridge	21.0	21.4	30.8	31.4	32.1	32.8
Transbay Transit Passengers	10.4	11.7	-	-	-	-



Private auto toll rates on the Golden Gate Bridge adjusted to 1975 dollars using the Consumer Price Index.

FIGURE 7
EFFECT OF INFLATION ON BRIDGE TOLLS

1974. The proposed toll increase would restore the value of auto tolls to the level they occupied in 1968. In short, one would anticipate that the proposed increase in tolls would have some dampening effect on the growth in auto traffic, though it is not possible to quantify that effect.

3.2 Socioeconomic

3.2.1 Geographic Distribution

There are 1,100,000 residents and 500,000 jobs in the counties of the Golden Gate Transit service area (San Francisco, Marin and Sonoma Counties).

Low income households, racial minorities, ethnic groups and elderly persons form a higher proportion of the population in San Francisco than in Marin or Sonoma Counties. The localities with lowest median income are central and southeast San Francisco and Marin City. The distribution of poor, elderly and racial minorities is shown in Table 7.

The 1970 Census reported that 15.8% of the nine-county Bay Region's occupied housing units had no auto available. Nearly half of San Francisco residents live in households with no automobile.

TABLE 7
DISTRIBUTION OF POOR, ELDERLY AND MINORITIES

GROUP	S.F. Bay Area 9 County Region	San Francisco	Marin	Sonoma
RACIAL MINORITIES				
Spanish-Surname	13%	14%	6%	7%
Black	8%	13%	2%	1%
Asian	5%	13%	1%	1%
PERSONS 65 & OLDER	8.9%	13.9%	8.7%	12.9%
PERCENT OF HOUSEHOLDS WITH INCOMES BELOW POVERTY LEVEL (\$3,700 for a non- farm family of 4)	9.4%	14.6%	9.2%	15.8%

Source: 1970 Census of Population

3.2.2 Characteristics of Bridge and Transit Users

A socioeconomic profile of Marin County residents using Golden Gate Transit bus services is given in Table 8. No similar information is available covering San Francisco and Sonoma County residents or users of the Golden Gate Ferries or the Golden Gate Bridge. The distribution of Golden Gate Bridge users in private automobiles by place of automobile registration is given in Table 3.

Socioeconomic data relating to commuters between San Francisco and the east bay counties developed by the BART Impact Program (Reference 12) indicate that median family income is in the range of \$20,000 to \$25,000 per year for transit commuters and is in the range of \$23,000 to \$30,000 per year for auto commuters. Fewer than 3% are members of households below the poverty level. The commuters are predominantly white and male. (Note: This information was derived from the BART impact studies by consultants of MTC (Reference 9) and made available to the authors of this Initial Study. It has not been checked and authenticated by the authors.)

It is anticipated that the proposed discounts on the price of tolls and fares will benefit commuters more than other users of the Bridge and transit services. Thus, the data of Table 8 indicates that the effect of the proposed discounts will be to place the burden of increased fares more heavily upon the lower income travellers, the young, the old and the transit dependent.

3.2.3 Low Income Families

To the extent that the proposed toll and fare increases would be levied equally upon all parties not the subject of current discount provisions, their payment would comprise a greater portion of the incomes of travellers in the lower income groups, and the action would be regressive in nature.

TABLE 8

SOCIOECONOMIC PROFILE OF MARIN COUNTY RESIDENTS USING

GOLDEN GATE TRANSIT BUS SERVICES

	Marin Local (%)	Marin/SF Basic (%)	Marin/SF Commute (%)	Factored Marin Residents Using GGT (%)	Marin Census (%)
<u>Income</u>					
Under \$4,000	38.2	27.7	2.8	21.1	6.9
\$4,000 to \$9,999	19.2	22.0	12.0	16.6	21.9
\$10,000 to \$11,999	9.0	9.3	4.6	7.2	10.6
\$12,000 to \$14,999	9.2	11.7	11.1	10.5	16.5
\$15,000 to \$24,999	12.7	17.8	30.6	21.3	30.4
\$25,000 to forever	11.7	11.5	38.9	23.3	13.7
<u>Auto Ownership</u>					
None	28.3	36.4	0.0	17.6	7.1
1	35.4	40.7	46.8	41.3	44.0
2	24.9	16.3	46.8	32.7	41.2
3 or more	11.4	6.6	6.4	8.4	7.7
<u>Auto Availability</u>					
Yes	25.0	35.1	75.4	48.5	-
No	75.0	64.9	24.6	51.5	-
<u>Sex</u>					
Male	43.2	53.5	63.2	53.7	49.8
Female	56.8	46.5	36.8	46.3	50.2
<u>Age</u>					
Under 5	0.4	0.0	0.0	0.1	7.5
5-14	11.0	2.3	0.8	5.0	19.2
15-19	33.8	9.5	1.7	15.6	8.2
20-24	18.1	22.3	10.2	15.5	7.3
25-44	20.5	41.4	53.4	38.5	29.4
45-59	7.4	12.8	31.4	18.7	17.4
60-64	2.4	3.9	1.7	2.4	3.6
65 and over	6.4	7.8	0.8	4.2	7.4

SOURCE: Analysis of Transit Surveys, December 1975
and February and May of 1976.
Kenneth Hough, GGBHTD

3.2.4 Shopping, Recreational and Social Patterns.

Investigations of traveller response to transit fare changes (Reference 13) indicate that, for large U.S. cities in general, a fare increase will cause larger percentage reductions in travel among persons travelling for shopping, recreational and social purposes than for persons commuting to work or school:

3.2.5 Employment

The proposed toll increase amounts to 25¢ per day for automobile commuters travelling alone, 5¢ per day for commuters using discount books, half these amounts for commuters sharing with one other passenger, and no increase for carpools of three or more occupants. At these levels there is no concern that any workers may leave their employment or forego employment opportunities due to the increased cost of commuting.

For passengers commuting by transit between Sonoma County and San Francisco, the proposed increases amount to \$1.50 per day, or 60¢ for commuters using discount books. It is conceivable that these increases might cause some low-income Sonoma residents to forego employment opportunities in San Francisco, and some low-income San Francisco residents to forego employment opportunities in Sonoma.

3.3 Land Use and Regional Planning.

Land use patterns, as they relate to the proposed action, are described in Section 2.0 of this study. They are discussed in greater detail in References 6, 8, 10 and 11.

3.3.1 Local Land Use Patterns.

The proposed action does not involve or directly cause the con-

struction or relocation of any facility or activity that would attract significant numbers of travellers, or attract or discourage development at any particular site.

The Regional and the various local land use plans are all committed to the development and maintenance of strong local activity centers as focal points for urban growth, and all identify effective public transportation as an important means of attaining this form of development.

3.3.2 Growth Inducement.

The Regional and local planning authorities believe that ease and economy of access to San Francisco is a significant factor encouraging suburban growth (References 6, 7, 8, 9, 10 and 11). By adjusting tolls for the effect of recent inflation (see Figure 7) the proposed action will correct the probable growth-inducing effect of maintaining constant tolls during a period of inflation.

3.3.3 Employment Location.

There is at present a general trend for the relocation of specific industrial and commercial businesses from San Francisco to suburban areas and the attraction of new businesses to the the suburbs rather than to San Francisco. (References 8 and 9). There is no basis in existing knowledge for concluding that the proposed action might have a significant effect on this trend; or that any effect, significant or insignificant, might serve to encourage to discourage the trend.

3.4 Air Quality

The Bay Area Air Pollution Control District has primary responsibility

for maintenance of air quality in the San Francisco Intrastate Air Quality Control Region. The Primary Pollutants of concern for the Region, and the average daily emission rates from highway vehicles and all other sources combined, are:

Primary Pollutant	Emissions (tons/day)
Hydrocarbons (HC)	1,000
Carbon Monoxide (CO)	660
Nitrogen Oxides (NOX)	3,700
Sulphur Oxides (SOX)	220
Particulates (P)	130

(SOURCE: Reference 9)

Highway vehicle emissions have been and will continue for some years to be the main source of air pollution in the Region. Though vehicular traffic continues to grow, the effect of the current program of vehicular emission controls more than offsets the growth, promising continued improvement in regional air quality during the next few years.

Carbon Monoxide and Nitrogen Oxides are the critical emissions concerned with the effects on air quality of proposals involving changes to vehicular traffic. The total output of vehicular emissions related to a specific proposal depends on the number and type of the vehicles, their distances travelled, their speed and traffic conditions.

Bus and Ferry vehicles, when fully loaded, produced only a fraction of the emissions of the equivalent number of automobiles. When nearly empty they produce more emissions than the equivalent number of autos. The relative amount of emissions associated with the proposed action and each of the alternatives is shown on Tables 9 through 13.

It should be noted that Table 9 (which describes a continuation of the existing toll and fare structure) is an unrealistic "base case". It is hypothetical since it assumes a continued growth in transit

TABLE 9

EMISSIONS ANALYSIS FOR THE CASE ASSUMING
EXISTING TOLLS AND FARES WITH HYPOTHETICAL CONTINUATION OF TRANSIT

	DIFFERENCE FY 1976-77 AND FISCAL YEARS:				
	1977-78	1978-79	1979-80	1980-81	1981-82
INCREASE IN VMT ($\times 10^6$)					
Autos	11.2	27.7	46.6	61.5	78.2
Transit	0.068	0.134	0.223	0.298	0.375
INCREASE IN EMISSIONS (Tons Per Year)					
CO.					
Auto ($27 \times 10^{-6} \text{T/VM}$)	302	748	1,258	1,661	2,111
Transit ($31 \times 10^{-6} \text{T/VM}$)	2	4	7	9	12
NET INCREASE	304	752	1,265	1,670	2,123
H.C.					
Auto ($4.0 \times 10^{-6} \text{T/VM}$)	45	111	186	246	313
Transit ($5.0 \times 10^{-6} \text{T/VM}$)	0	1	1	2	2
NET INCREASE	45	112	187	248	315
NOx					
Auto ($2.0 \times 10^{-6} \text{T/VM}$)	22	55	93	123	156
Transit ($23 \times 10^{-6} \text{T/VM}$)	2	3	5	7	9
NET INCREASE	24	58	98	130	165
SOx					
Auto ($0.1 \times 10^{-6} \text{T/VM}$)	1.1	2.8	4.7	6.2	7.8
Transit ($3.0 \times 10^{-6} \text{T/VM}$)	0.2	0.4	0.7	0.9	1.1
NET INCREASE	1.3	3.2	5.4	7.1	8.9
PARTICULATES					
Auto ($0.2 \times 10^{-6} \text{T/VM}$)	2.2	5.5	9.3	12.3	15.6
Transit ($3.0 \times 10^{-6} \text{T/VM}$)	0.2	0.4	0.7	0.9	1.1
NET INCREASE	2.4	5.9	10.0	13.2	16.7

ASSUMPTIONS:

Average distance travelled per auto crossing bridge = 20 miles
 Average distance travelled per bus crossing bridge = 20 + 4 deadhead = 24 miles
 Average load factor 40 passengers/bus

SOURCE: Reference 9

TABLE 10

EMISSIONS ANALYSIS FOR THE CASE ASSUMING
\$1.00 AUTO TOLL; 6 FARE ZONES WITH \$2.25 MAXIMUM FARE
20% DISCOUNT ON FARES, NO DISCOUNT ON TOLLS

	DIFFERENCE FY 1976-77 AND FISCAL YEARS:				
	1977-78	1978-79	1979-80	1980-81	1981-82
INCREASE IN VMT ($\times 10^6$)					
Autos	16.6	33.3	52.3	67.3	84.2
Transit	-0.099	-0.036	0.049	0.120	0.193
INCREASE IN EMISSIONS (Tons Per Year)					
CO.					
Auto ($27 \times 10^{-6} \text{T/VM}$)	448	899	1,412	1,817	2,273
Transit ($31 \times 10^{-6} \text{T/VM}$)	-3	-1	2	4	6
NET INCREASE	445	898	1,414	1,821	2,279
H.C.					
Auto ($4.0 \times 10^{-6} \text{T/VM}$)	66	133	209	269	337
Transit ($5.0 \times 10^{-6} \text{T/VM}$)	-1	0	0	1	1
NET INCREASE	65	133	209	270	338
NOx					
Auto ($2.0 \times 10^{-6} \text{T/VM}$)	33	67	105	135	168
Transit ($23 \times 10^{-6} \text{T/VM}$)	-2	-1	1	3	4
NET INCREASE	31	66	106	138	172
SOx					
Auto ($0.1 \times 10^{-6} \text{T/VM}$)	1.7	3.3	5.2	6.7	8.4
Transit ($3.0 \times 10^{-6} \text{T/VM}$)	-0.3	-0.1	0.2	0.4	0.6
NET INCREASE	1.4	3.2	5.4	7.1	9.0
PARTICULATES					
Auto ($0.2 \times 10^{-6} \text{T/VM}$)	3.3	6.7	10.5	13.5	16.8
Transit ($3.0 \times 10^{-6} \text{T/VM}$)	-0.3	-0.1	0.2	0.4	0.6
NET INCREASE	3.0	6.6	10.7	13.9	17.4

ASSUMPTIONS:

Average distance travelled per auto crossing bridge = 20 miles
 Average distance travelled per bus crossing bridge = 20 + 4 deadhead = 24 miles
 Average load factor 40 passengers/bus

SOURCE: Reference 9

TABLE 11

**EMISSIONS ANALYSIS FOR THE CASE ASSUMING
\$1.00 AUTO TOLL; 6 FARE ZONES WITH \$2.25 MAXIMUM FARE
20% DISCOUNT ON FARES AND TOLLS**

	DIFFERENCE FY 1976-77 AND FISCAL YEARS:				
	1977-78	1978-79	1979-80	1980-81	1981-82
INCREASE IN VMT ($\times 10^6$)					
Autos	18.8	35.5	54.5	69.6	86.5
Transit	-0.164	-0.102	0.019	0.051	0.122
INCREASE IN EMISSIONS (Tons Per Year)					
CO.					
Auto ($27 \times 10^{-6} \text{T/VM}$)	508	959	1,472	1,879	2,336
Transit ($31 \times 10^{-6} \text{T/VM}$)	-5	-3	-1	2	4
NET INCREASE	503	956	1,471	1,881	2,340
H.C.					
Auto ($4.0 \times 10^{-6} \text{T/VM}$)	75	142	218	278	346
Transit ($5.0 \times 10^{-6} \text{T/VM}$)	-1	-1	0	0	1
NET INCREASE	74	141	218	278	347
NOx					
Auto ($2.0 \times 10^{-6} \text{T/VM}$)	38	71	109	139	173
Transit ($23 \times 10^{-6} \text{T/VM}$)	-4	-2	0	1	3
NET INCREASE	34	69	109	140	176
SOx					
Auto ($0.1 \times 10^{-6} \text{T/VM}$)	1.9	3.6	5.5	7.0	8.7
Transit ($3.0 \times 10^{-6} \text{T/VM}$)	-0.5	-0.5	-0.1	0.2	0.4
NET INCREASE	1.4	3.3	5.4	7.2	9.1
PARTICULATES					
Auto ($0.2 \times 10^{-6} \text{T/VM}$)	3.8	7.1	10.9	13.9	17.3
Transit ($3.0 \times 10^{-6} \text{T/VM}$)	-0.5	-0.3	-0.1	0.2	0.4
NET INCREASE	3.3	6.8	10.8	14.1	17.7

ASSUMPTIONS:

Average distance travelled per auto crossing bridge = 20 miles
 Average distance travelled per bus crossing bridge = 20 + 4 deadhead = 24 miles
 Average load factor 40 passengers/bus

SOURCE: Reference 9

TABLE 12

**EMISSIONS ANALYSIS FOR THE CASE ASSUMING
\$1.00 AUTO TOLL; 6 FARE ZONES WITH \$2.00 MAXIMUM FARE
10% DISCOUNT ON FARES; NO DISCOUNT ON TOLLS**

	DIFFERENCE FY 1976-77 AND FISCAL YEARS:				
	1977-78	1978-79	1979-80	1980-81	1981-82
INCREASE IN VMT ($\times 10^6$)					
Autos	19.3	36.0	55.1	70.2	87.1
Transit	-0.184	-0.122	-0.040	0.030	0.100
INCREASE IN EMISSIONS (Tons Per Year)					
CO.					
Auto ($27 \times 10^{-6} \text{T/VM}$)	521	972	1,488	1,895	2,352
Transit ($31 \times 10^{-6} \text{T/VM}$)	-6	-4	-1	-1	3
NET INCREASE	515	968	1,487	1,894	2,355
H.C.					
Auto ($4.0 \times 10^{-6} \text{T/VM}$)	77	144	220	281	348
Transit ($5.0 \times 10^{-6} \text{T/VM}$)	-1	-1	0	0	1
NET INCREASE	76	143	220	281	349
NOx					
Auto ($2.0 \times 10^{-6} \text{T/VM}$)	39	72	110	140	174
Transit ($23 \times 10^{-6} \text{T/VM}$)	-4	-3	-1	1	2
NET INCREASE	35	69	109	141	176
SOx					
Auto ($0.1 \times 10^{-6} \text{T/VM}$)	1.9	3.6	5.5	7.0	8.7
Transit ($3.0 \times 10^{-6} \text{T/VM}$)	-0.6	-0.4	-0.1	0.1	0.3
NET INCREASE	1.3	3.2	5.4	7.1	9.0
PARTICULATES					
Auto ($0.2 \times 10^{-6} \text{T/VM}$)	3.9	7.2	11.0	14.0	17.4
Transit ($3.0 \times 10^{-6} \text{T/VM}$)	-0.6	-0.4	-0.1	0.1	0.3
NET INCREASE	3.3	6.8	10.9	14.1	17.7

ASSUMPTIONS:

Average distance travelled per auto crossing bridge = 20 miles
 Average distance travelled per bus crossing bridge = 20 + 4 deadhead = 24 miles
 Average load factor 40 passengers/bus

SOURCE: Reference 9

TABLE 13

**EMISSIONS ANALYSIS FOR THE CASE ASSUMING
\$1.00 AUTO TOLL; 6 FARE ZONES WITH \$2.25 MAXIMUM FARE
10% DISCOUNT ON FARES AND TOLLS**

	DIFFERENCE FY 1976-77 AND FISCAL YEARS:				
	1977-78	1978-79	1979-80	1980-81	1981-82
INCREASE IN VMT ($\times 10^6$)					
Autos	2.10	37.7	56.9	72.0	88.9
Transit	-0.243	-0.183	-0.102	0.034	0.036
INCREASE IN EMISSIONS (Tons Per Year)					
CO.					
Auto ($27 \times 10^{-6} \text{T/VM}$)	567	1,018	1,536	1,944	2,400
Transit ($31 \times 10^{-6} \text{T/VM}$)	-8	-6	-3	-1	1
NET INCREASE	559	1,012	1,533	1,943	2,401
H.C.					
Auto ($4.0 \times 10^{-6} \text{T/VM}$)	84	151	228	288	356
Transit ($5.0 \times 10^{-6} \text{T/VM}$)	-1	-1	-1	0	0
NET INCREASE	83	150	227	288	356
NOx					
Auto ($2.0 \times 10^{-6} \text{T/VM}$)	42	75	114	144	178
Transit ($23 \times 10^{-6} \text{T/VM}$)	-6	-4	-2	-1	1
NET INCREASE	36	71	112	143	179
SOx					
Auto ($0.1 \times 10^{-6} \text{T/VM}$)	2.1	3.8	5.7	7.2	8.9
Transit ($3.0 \times 10^{-6} \text{T/VM}$)	-0.7	-0.6	-0.3	-0.1	0.1
NET INCREASE	1.4	3.2	5.4	7.1	9.0
PARTICULATES					
Auto ($0.2 \times 10^{-6} \text{T/VM}$)	4.2	7.5	11.4	14.4	17.8
Transit ($3.0 \times 10^{-6} \text{T/VM}$)	-0.7	-0.6	-0.3	-0.1	0.1
NET INCREASE	3.5	6.9	11.1	14.3	17.9

ASSUMPTIONS:

Average distance travelled per auto crossing bridge = 20 miles
 Average distance travelled per bus crossing bridge = 20 + 4 deadhead = 24 miles
 Average load factor 40 passengers/bus

SOURCE: Reference 9

service--a result at odds with the fiscal reality that transit service (revenue mileage) would be reduced were no increase in revenue to occur.

3.5 Energy

It is desirable that public actions affecting transportation should, as far as possible, encourage the efficient use of the nation's energy supplies and to conserve its energy resources. The District's ferries and buses use diesel oil. Private automobiles almost exclusively use gasoline. Both fuels, being derivatives of petroleum, are critical to the nation's attempts to achieve more economical use of energy. Changes in fuel consumption, related to the proposed action or its alternatives, are closely related to changes in vehicle miles travelled (VMT). Estimated changes in VMT are shown in Tables 9 thru 13.

3.6 Noise

Noise impacts could result from changes in traffic volumes or traffic conditions changes in the location of traffic flow relative to noise sensitive areas and changes to transit operations.

The proposed action would not result in the relocation of any traffic flows or significant change in the volume of such flows. The proposed action would, therefore, have no impacts resulting from changes in general traffic noise.

3.7 Other Environmental Concerns

The following environmental concerns were reviewed and it is concluded that the proposed action would not result in any potential environmental impact relative to these concerns.

3.7.1 Services and Utilities

The provision of water supply, sewage disposal, gas, oil, electricity, telephone, Cable TV, solid waste, medical, educational, news, building maintenance, domestic and other services would not be affected by the proposed action.

3.7.2 Fiscal

The proposed action would provide additional revenues to the Golden Gate Bridge, Highway and Transportation District. The action would not deprive local governmental of their property tax, sales tax, or special license revenue sources, nor interfere in any way with these revenue sources. Specifically, the proposed action would not have a significant effect on the local property tax base. The proposed action would not interfere with the revenue sources of any regional or subregional public authority.

3.7.3 Construction

No new construction or alteration of existing facilities is included in or would result directly from the proposed action.

3.7.4 Geology and Soils

The proposed action would not change the exposure to risk by the local populations, or their property, from seismic or tsunami hazards, unstable soils or flooding.

3.7.5 Water Resources

The proposed action would have no significant effect on the flow or quality of surface waters, ground water, natural or man-made drainage.

3.7.6 Topography

The proposed action involves no construction and no inducement to growth, and will have no effect on the topography of the region.

3.7.7 Climate

The proposed action would have no significant effect on regional air quality (Section 6.4) and no other effect that might affect the the climate of the region. It would involve no construction or other activity that might change local wind patterns or exposure to frost or sunshine or cause local change to ground or atmospheric temperatures.

3.7.8 Wildlife and Vegetation

The proposed action, involving no construction in traffic patterns, would have no effect on wildlife or vegetation of the area.

3.7.9 Visual, Aesthetic and Archeological Resources

The proposed action, involving no construction or change in traffic patterns, will have no effect on visual, aesthetic or archeological resources.

3.7.10 Mineral, Agricultural and Recreational Resources

The proposed action involves no mineral extraction or processing, no construction or significant effect on land use and no effect on the performance of agriculture or use of agricultural land. It has no significant effect on the quality or use of local recreational areas.

3.7.11 Human Health

The proposed action does not involve the production, storage or transportation of any chemically, biologically or radiologically hazardous material or equipment. It would have no effect on human health.

4.0 MITIGATION

As indicated in the identification of environmental impacts (Section 3); there are three areas of possible impact--air quality, noise and energy use--all of which are related to increases in vehicle miles travelled by passenger automobile in response to the fare/toll increase.

It is not possible to conclude that any of these impacts are significant in a regional or even local context with directly available data. Until such comparisons have been made, it would be premature to discuss mitigation measures.

However, it is apparent that whatever level of impact may occur could be reduced by encouraging additional transit ridership through other price-related measures. For example, these impacts could be mitigated by:

- (a) Vigorously pursuing all opportunities to achieve maximum productivity from the bus fleet, such as extension of exclusive bus lanes, bus priority signals and similar measures to reduce traffic delays to bus operations;
- (b) Making every effort to achieve full utilization of the ferry system;
- (c) Continuing efforts to introduce high capacity buses into service as a means to improved productivity; and
- (d) Implementing commuter vanpool program.

5.0 COMPATIBILITY WITH EXISTING PLANS, ZONING AND PUBLIC POLICIES

5.1 The State Transportation Plan

The State of California is in the process of developing a State Transportation Plan. On March 17, 1976, the State Transportation Board submitted its proposed State Transportation Plan to the State Legislature. The plan generally emphasizes the need for expanded transit services and reduced emphasis on private automobile use.

To the extent that the proposed increases in tolls and fares will provide the revenue base needed to maintain the District's transit system as planned and developed, the proposed action is compatible with the State Transportation Plan.

5.2 Regional Plans

The nine county San Francisco Bay Region is one of 41 regions recognized in the State Transportation Plan, with the Metropolitan Transportation Commission (MTC) being the regional planning authority. Created by state law in September of 1970, MTC coordinates planning and public expenditures on transportation with the Region. In June of 1973, MTC adopted the Regional Transportation Plan (RTP) (Reference 7) which included a Transportation Development Program (TDP) and Financial Plan. More recently, a Transportation Improvement Plan (TIP), conforming to joint FHWA/UMTA regulations, has replaced the TDP. The annually updated RTP and TIP meet all transportation planning requirements of the U.S. Department of Transportation and State of California, and the requirements of the National Environmental Protection Act (NEPA) and California Environmental Quality Act (CEQA).

The Regional Transportation Plan involves a transition from an

automobile-oriented regional transportation system to a system of balanced automobile and public transportation use. Emphasis is on the development of attractive, efficient public transportation services. The services of the region's various public transportation operators will be coordinated by the recently formed Transit Federation.

The Regional Land Use Plan (Reference 6) prepared by the Association of Bay Area Governments (ABAG) calls for the development of a city-centered pattern of development with functionally integrated communities, shorter journey-to-work times, and conservation of open space. MTC is committed to support the Regional Land Use Plan, and the Regional Transportation Plan is a critical element in its success. ABAG is also preparing a Regional Growth Management Program which is affected by the implementation of the Regional Transportation Plan and by joint staff work as a part of the ABAG/MTC Joint Program.

The U.S. Environmental Protection Agency (EPA), the California Air Resources Board (CARB) and the Bay Area Air Pollution Control District (BAAPCD) are involved with the MTC preparing rules and policies for transportation controls aimed at reducing air pollution.

The Metropolitan Transportation Commission recognizes the need to raise additional toll revenues on San Francisco Bay bridges as a means to provide additional funding for public mass transportation and other transportation needs of the Region. Pursuant to Chapter 1229, California Statutes of 1975, the Commission proposed to adopt revised toll schedules for the San Francisco-Oakland Bay Bridge, the San Mateo-Hayward Bridge and The Dunbarton Bridge, effective July 1, 1977. The revised schedules would raise the tolls for private automobiles, on each of the bridges, to \$1.00 to be paid in the eastbound direction only.

On January 29, 1976, MTC adopted Resolution No. 299 requiring specific progress toward "making transportation services reasonably accessible to handicapped persons". The District, in conjunction with MTC and numerous Federal, State and local agencies and organizations and individual citizens, is currently conducting studies to develop a program of improved transportation services for the elderly and handicapped. It is anticipated that, during the summer of 1977, the studies will result in proposals for specific service improvements.

In the Golden Gate Recreational Travel Study, the District, along with MTC and six other Federal, State and local agencies, is cooperating with the National Park Service to achieve improved management of the use of local recreational areas. Fundamental to the success of the program is the provision of adequate public transportation to facilitate access while limiting the environmental intrusion of private automobiles. To the extent that the proposed toll and fare increases make it possible to continue operation of the District's transit services as planned and developed, the proposed action is compatible with the above regional plans.

5.3 Local Plans

The San Francisco Planning Commission, on May 27, 1976, adopted policies relevant to the provision of public transportation services to and within the City and County of San Francisco. The statement places highest priority on measures to attract and carry an increased proportion of commuters by public transportation. It places particular emphasis on the need to attain full utilization of the Golden Gate Ferry services.

The Marin Countywide Plan (Reference 10) and the Sonoma County General Plan (Reference 11) both contain Transportation Elements which

require the continuation of the District's transit services.

To the extent that the proposed toll and fare increases make it possible to continue operation of the District's transit services as planned and developed, the proposed action is compatible with the above local plans.

5.4 District Plans

The District's policies and plans for its transportation services are embodied in its reports to the California State Legislature of April, 1971, and September, 1975 (References 1 and 2).

The District's plans were developed in cooperation with other Regional agencies and local jurisdictions. They are consistent with and, in part, embody elements of the Regional and local plans cited in Sections 5.2 and 5.3 above. The District's plans constitute a commitment to the maintenance of transportation services having high comfort and environmental standards, committed to prudent and conservative investment, with further expansion of facilities only to meet clearly demonstrated needs.

The additional toll and farebox revenues that would result from the proposed action are essential to the implementation of the District's plans.

6.0 AUTHORS AND PERSONS CONTACTED

This Initial Environmental Study was prepared by the staff of the Golden Gate Bridge, Highway and Transportation District. It was undertaken at the direction of Dale W. Luehring, General Manager. The work was performed under the direct supervision of Jerome M. Kuykendall, Assistant to the General Manager for Planning and Research. The principal author and work coordinator was Peter Dyson, Senior Planner. Assistance was provided by Tim Youmans, Assistant Planner; Ben Fong, Senior Draftsman; Candy Adcock, Secretary; and Alan R. Zahradnik, Assistant with MTC's Technical Assistance Program.

The consulting firm of McDonald & Grefe, Inc., of San Francisco, completed four special runs of the District's "Pricing Model" (see Reference 4) and provided certain technical advice incidental to this task. Angus M. McDonald, President, and William Kent, Programmer, performed this work.

The consulting firm of DeLeuw Cather & Company of San Francisco, having been retained by the Metropolitan Transportation Commission (MTC) to perform an initial environmental study on the Commission's proposed toll increases for Bay bridges, simultaneously provided advice to the District relating to the technical compatibility of MTC and District studies. This advice included matters of format and environmental definitions and concepts, and was provided by Walter Kudlick, Vice President, and Paul Holley, Project Manager.

Drafts of this Initial Study were reviewed for accuracy and clarity of technical presentation by the following senior staff of the District:

R. D. Tough, Auditor--Controller
Harry D. Reilich, District Engineer
H. Donald White, Manager--Bus Transit Division
Stanley M. Kowleski, Manager--Ferry Transit Division
Robert A. Warren, Manager--Bridge Division

and was reviewed for legal sufficiency by:

David J. Miller, Attorney for the District.

Various MTC staff members were consulted concerning the availability of relevant data and analytical tools and the technical compatibility of the MTC and District studies. These staff members included Burton Crowell, Assistant Director "A" Division; Paul Maxwell, Geraldine Steere, and Vincent Petrites of "B" Division.

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GOLDEN GATE BRIDGE, HIGHWAY AND TRANSPORTATION DISTRICT

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